Experimental Psychology
its scope and method

V Motivation, emotion and personality

Experimental Psychology: its scope and method

edited by Paul Fraisse and Jean Piaget

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i History and method
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Experimental Psychology
its scope and method

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V Motivation, emotion and personality

by Joseph Nuttin, Paul Fraisse
and Richard Meili

Translated by Madame Alain Spillmann

S.C.E.R.T., West Bengal
Library
Calcutta
25/3, R. C. Road

Routledge & Kegan Paul London

Translated from the French

TRAITE DE PSYCHOLOGIE EXPERIMENTALE

V. MOTIVATION, EMOTION ET PERSONNALITÉ

© *1963 Presses Universitaires de France*

First published in Great Britain 1968
by Routledge & Kegan Paul Limited
Broadway House, 68–74 Carter Lane
London, E.C.4

Printed in Great Britain by
Western Printing Services Limited
Bristol

English translation
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Chapter 15

Motivation

Joseph Nuttin

1 Behaviour and motivation

Psychologists are far from agreeing on the importance of motivation in the study and explanation of behaviour. Some consider motivation a superfluous idea destined to disappear from the vocabulary of experimental psychology, while others regard it as the crucial principle of psychology and the key to understanding behaviour. The source of this disagreement arises out of the confusion surrounding the concept of motivation. To clarify the subject under discussion it is necessary to elucidate some of the negative concepts and thus extract those behavioural characteristics which we believe require the use of that 'intermediary variable', namely the motivational process.

1 Negative positions

A) It is true that under the heading of motivation experimental psychology concentrated mainly on needs and drives which were primarily of a physiological origin, such as hunger, thirst, sexuality, the need for oxygen, sleep, evacuation etc. The principal object of this kind of research is the study of the influence of certain physiological conditions of the organism on behaviour. So motivation in the eyes of certain behaviourist writers is no more than a global term of little scientific significance used to designate the influence on behaviour of a variety of physiological states. We do not yet know enough about the effect on behaviour of sexuality and hunger, for example, to be able to group them under the common heading of 'motivational process' thereby distinguishing them from other physiological so-called non-motivational influences which are equally unknown. These authors propose that psychology should study all the determinants of behaviour without isolating or grouping any of them under the heading of 'motivation', a term borrowed from pre-scientific vocabulary.

B) Within the stimulus-response framework, the excitation is considered as the actual start of the organism's reaction. With reflexes, for example, the stimulus may be considered sufficient to start a reaction. This led several authors to neglect or even to deny the problem of motivation. They recognize that the living organism is essentially reactive, that is to say, it reacts in a specific way to excitation it receives. This fundamental characteristic, combined with the action of the stimulus, would provide a sufficiently dynamic explanation of behaviour. However, the need for a motivational factor soon became evident to certain experimenters who observed that the organism does not always react to the excitation produced by the environment. The sexual object or food which, under certain circumstances, provokes a reaction, may sometimes have no effect. It seems indispensable to introduce a factor to explain this difference of reactivity. This factor could be considered in terms of the difference of threshold in receptivity, or of the sensitivity of the organism towards a particular excitation. That is what some contemporary psychologists mean by motivation: a factor which sensitizes and activates the organism towards an excitation. In other words, motivation is a state of the organism whose function is to lower the threshold of reactivity to certain excitations. Motivation is then referred to as an energizer or a sensitizer (*vide inter alios* Nissen, 1954). The process of learning or conditioning is utilized to explain the changes which take place in the form of reactions to various stimuli. Thus the idea of motivation seems almost superfluous here also; the process of stimulation and learning seem sufficient as an explanation of behaviour.

C) Certain psychologists use the idea of motivation principally to study the reason why the organism enters a state of general activity (*vide infra*, p. 8). Motivation is then referred to in terms of mobilization of energy. Some psychologists have protested recently against this concept (Kelly, 1958), claiming that it originates from a static conception of the organism: inactivity appearing to be the 'natural' state of living creatures, requiring a special stimulus to explain its activity. If the living organism is considered as intrinsically active, the idea of motivation becomes superfluous. Nowadays more and more emphasis is placed on the *spontaneous* activity of the nervous system and it is considered, moreover, that behavioural activity is linked to the very life of the organism in the same way as physiological activity. Hebb (1949), for example, formulated a hypothesis based, not on *re*activity, but on the natural activity of the nervous system. Contrary to what was believed up to thirty years ago, the nerve-cell has no need for external excitation to become active; it is not physiologically inert and its natural activity constitutes a system of automotivation. More recently, Hebb proposed that it was necessary to relate the general motivational state to the arousal function of the reticular structure of the brain stem. This idea is more or less ismilar to that which regards the stimulus as initiating activity, since Hebb sees the 'arousal system' (reticular formation) as a secondary medium through which all sensory excitation reaches the cortex (Hebb, 1955, p. 248–9).

2 *The motivational phenomenon*

A) It is obvious that the formulation of the organism's behaviour in terms of stimulus-response in experimental psychology partly conceals the problematical question of motivation. In daily life, however, human conduct is normally considered to be guided and ordered according to a plan and it is an attempt to achieve or attain an objective. This second schema may also correspond to a psychic reality and must therefore have a scientific value. Whereas the first takes the elementary reaction of reflex as a model, the subject matter of the second is the complex reality of human conduct. However, it seems that the effort or tendency to strive for something is to be found, in very varying degrees, in many examples of subordinate conduct. Indeed we must not forget that what we call an unconditioned *stimulus* in a classical conditioning experiment, as in the general psychology of behaviour, is in fact something which the animal is constantly seeking after in normal life. Food is regarded as a stimulus by the experimenter who applies it to the gustatory organ of the animal in the laboratory in order to study the physiological secretions released, but it is considered the object of extensive motivated activity by those who study the animal's behaviour in its natural environment. Because of this the very varied meanings which are attributed to the term 'stimulus' do not make the problem of motivation any simpler. Our study will therefore be facilitated if, in addition to conditioning and S-R theory, we also regard behaviour as the search for a situation or object, either absent or as yet non-existent. It must be apparent that this latter concept forms the fundamental belief of yet another group of psychologists for whom motivation provides a key to the understanding of human conduct.

B) What aspects of behaviour are connected with motivation? Fundamentally, the organism or the individual is characterized by his preferential or selective relations with regard to the objects or situations of his environment. Faced with a certain number of objects, he covets or prefers some while rejecting others; with regard to non-existent objects and situations, he craves, seeks and pursues some and fears others. This orientation is shown by the fact that the conduct persists until a well-defined objective is reached; this puts an end—provisionally or finally—to the subject's activity. This selective orientation towards a preferred or chosen object gives its intrinsic direction and organization to behaviour. The object sought by the organism may be unknown to the individual himself, whereas in other cases an innate or acquired behaviour may guide him to the desired object. It should be added that the more or less continual pursuit of an absent or as yet non-existent objective is of capital importance to man. What is more, his cognitive and imaginative functions allow him to construct the missing object in anticipatory or compensatory fashion; hence the importance ascribed to imaginative construction in certain researches into human motivation (*vide infra*, p. 24).

This active, persistent and selective purposiveness which characterizes behaviour is the basic motivational phenomenon which appears in many forms according to the kind of conduct (innate or acquired, for example) and the level of development of the organism. This conception implies that motivation is at the same time a source of activity and of direction; or, more precisely, it defines conduct as a directed activity. These two aspects, the dynamic and the proposive, have too often been separated in the study of motivation, as will be shown regarding the general activity of the organism and the learning process in connexion with motivation.

C) For more accurate delimitation of the field of motivation, Woodworth (1918, pp. 36–7) distinguishes between the 'mechanism' of behaviour and the factors which set it in motion. The first problem is the *how* of the behaviour process, the second asks why the man or the animal does something. The study of motivation is closely connected with this question of *why*. In this context, motives, incentives, drives, tendencies and needs are referred to; others speak of tension, force or even energy. It would obviously be incorrect to use the two latter terms in the precise sense they have in either mechanics or physics. It is often impossible to distinguish in psychology between the two ideas of force and energy. The old physical concept which justifies, for some people, its use in the study of behaviour, maintains that in psychology, as in physics, we need to explain the movement from a stage of inertia to that of action, or from one form of 'movement' to another (force); so that one likes to imagine that there is a certain capacity (energy) for producing work which exists. That is why the occasionally very sharp criticisms of the use of these terms in psychology (London, 1944; Wiener, 1950) fail to make any impact, as long as psychologists remain unaware of the analogous character of these expressions.

2 Motivation and association

1 The determinant drive

The methodological difficulties involved in the study of motivation do not seem the sole reason why it was so long treated as a poor relation in experimental psychology. The real reason is that psychology formulated the problem of 'why' psychical phenomena are produced in terms of associations and connexions. In fact, association provided one of the most popular trends of thinking in scientific psychology. Laws of association and, later, those of learning and conditioning explained why in state *x* the phenomenon *y* occurred. The problem of motivation—behaviour as the persistent pursuit of an object—was relegated to the background; even association itself was considered, at least implicitly, as a dynamic element.

Attention was the concept in nineteenth-century associationism which referred most explicitly to a motivational factor in purposive activity (Ribot, 1888; Lange, 1888; James, 1890, pp. 402–58). After being long neglected, this phenomenon is now attracting attention in the field of psychology and psychophysiology through discoveries about the reticular formation and the arousal system (*vide e.g.* Berlyne, 1960, pp. 45–77).

It was Külpe's school that demonstrated experimentally the inadequacy of a single associative connection to explain the occurrence of a psychic phenomenon. The verbal response to a presented word is not only determined by the associative connexion, but also by the attitude (*Einstellung*) of the subject, which is produced by the instructions (*Aufgabe*) (Watt, 1905). When the subject is asked to give a word rhyming with the presented word (white-height, for example) he does not react by giving a non-rhyming word strongly associated with it (white-black, for example), but automatically and without further conscious intervention adheres to the instructions. The instructions predetermine the direction and type of the subject's reaction, and his acceptance of the instructions create in him the *intention* or *volition* to act in this way. The resulting dynamic attitude is referred to as a *determining tendency* by Ach (1905) since it creates in the subject a tendency which determines his reaction.

2 *Measurement of the will*

As we have just seen, the motivation in question in the researches made by Külpe's school at Wurzburg is situated at the level of voluntary intention and attached to the acceptation of a task. A number of experimental researches on will were inspired by this school of thought, the best known being those of Michotte (1909), Ach (1910) and Lindworsky (1919). Ach used an ingenious method for measuring the 'strength of will' by opposing it to the strength of an associative connexion. The subject learns two series of pairs of syllables by repetition. The first list contains rhymes, the second inversions (rug-gur). The strength of the association between the two words of each pair is measured in terms of frequency of repetition. After the series has been learnt by a certain number of repetitions, the experimenter recites a new list of presentation words, instructing the subject to reply to each word or syllable with a rhyme. In the new list a syllable is inserted here and there which was the first syllable of a pair used in the two preceding lists. Ach expected by this means to oppose the strength of association to that of the determining tendency emanating from the instructions. Each time the presentation word was previously associated with an inverted syllable, the instruction to reply with a rhyme is more or less impeded; when the presentation word was previously associated with a rhyme, the reply is facilitated by the fact that the existing link and the determining tendency operate in the same direction. Significant differences in time of reaction as well as contamination of syllables (the associated syllable interfering with a syllable corresponding to the instructions) would reveal the existence of these opposed or combined forces, according to Ach. In other cases, the association is so great that the subject could be expected to make a mistake and give the inverted syllable which had been learnt instead of the rhyme. For example, Ach observes that in one of his experiments the intention to rhyme never overcomes an opposing association which has been built up on 120 repetitions. He calls the number of repetitions necessary for an association to overcome voluntary intention the 'associative equivalent'. In the experiment referred to, the associative equivalent is between 100 and 120 repetitions for a standard voluntary effort on the part of the subject. It may be noted that after a setback, for example, the subject's effort of will increases; as a result, the instructions are more constantly 'borne in mind' and the subject is able to overcome associative connexions of greater strength. However, the results obtained by Ach were very complicated and less clear than might have been expected, which encouraged Lewin to go further into the problem.

3 *Associative connexion and dynamic effect*

Kurt Lewin's work, which was the beginning of modern research in the field of human motivation, starts with an examination of

Ach's experiments. Examining this research with the idea of introducing greater precision, Lewin observed that in certain types of experiments there were no errors in the subject's reactions nor any significant differences in the reaction times (1917; 1922). He proved that in this kind of research the associative connexion influences the reproduction of a term only in as far as the subject assumes an *attitude of reproduction.* Giving a subject a list of presentation words previously associated with rhymes and merely asking him to give a rhyme for each word, Lewin observed frequent errors as soon as a word from another list was inserted (for example, a word previously associated with an inverted syllable). Lewin states that in that case the subject adopts a general attitude of reproduction, the effect of which is to elicit the association existing between the presentation word and also the inverted syllable taken from another list. These errors arising from associative connexions are not found in experiments where the subject does not assume an attitude of reproduction. In these cases the instructions are followed without hesitation despite the existence of associations between certain presentation words and syllables which are not in accordance with the instructions.

The important conclusion of this first series of Lewin's experiments is that the associative link has no dynamic effect in itself: 'Connexions as such never cause an event to happen' (Lewin, 1926), contrary to the claims of certain learning theories. Hull admits the need for a motivational factor (SDR or drive) to produce a response, in addition to SHR (habit strength) (1943; 1952).

Lewin's research (1922) was the beginning of a very important series of some twenty experimental works on motivation carried out by a group of his disciples, which were published in the journal of the Gestalt movement, *Psychologische Forschung*, between 1926 and 1938. It may be said that the study of human motivation entered its experimental phase with this research programme, parts of which will be analyzed in this chapter.

3 General non-directed activity

It is necessary to distinguish between two aspects of the problem of the 'why' of behaviour: first, what are the dynamic factors which determine the amount of general activity in the organism, and, secondly, why does the organism perform this or that well-defined action? The study of motivation must principally concentrate on the latter question. However, since much research on general activity is considered to belong to the field of motivation, it is necessary to say a few words about it.

A certain degree of behavioural activity seems linked to the very life of the organism in the same way as respiration or any other mechanism of biological adaptation (*vide supra*, p. 2). However, the fact remains that the degree of general activity of an organism may vary considerably according to certain well-defined conditions and the motivational state—that is, any state of need—is usually shown by increased activity. Furthermore, several studies have shown that the need for activity and movement is manifest as soon as an obstacle tries to intervene (Piéron 1959, p. 45; Fauville, 1955, pp. 114–20; and the 'reflex of liberty' spoken of by Pavlov, 1928, chap. 28, pp. 282–6).

1 The determinants of activity in animals and man

Many studies have been made on these variations of general activity in animals: those made by Richter, in 1927, are fundamental. The activity cage (Fig. 1) and the revolving drum apparatus (Fig. 2) are the two apparatuses most generally used. Some of the results obtained are as follows:

Periodic variations are observed in the functioning of the sexual and other hormonal secretion cycles for example (Fig. 3). Billingslea (1940) reports important increases connected with excitement and fear. In more recent studies, Hall (1956) observed that food deprivation as well as intensification of light and sound stimulation considerably increased activity in rats. Moskowitz (1959), using an improved method, found a quasi-linear relationship between the number of revolutions of a revolving drum (an increase of 100 to 1,100 revolutions per hour) and a gradual reduction in the food and water supply during a period of 41 days. It is clear that the motivational state of the animals was high, since during this experimental period the average weight of the rats fell from 85 to 60 per cent of the normal weight.

Considerable individual differences were noted in general activity. Shirley (1928) found that these differences remained

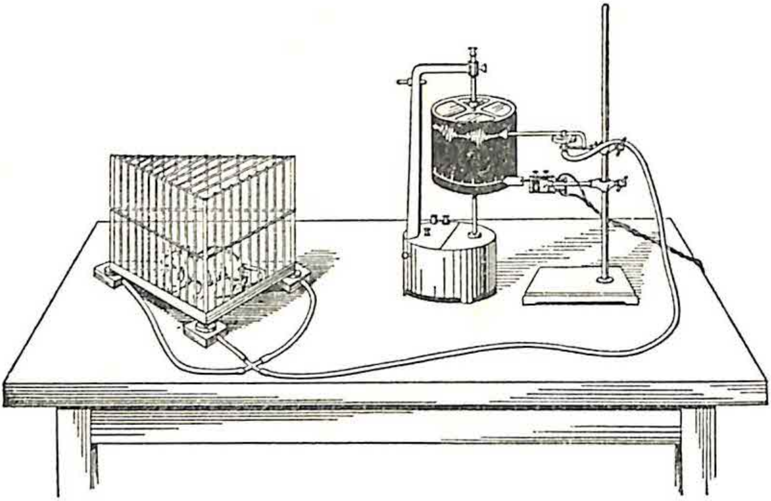

Fig. 1. A drum-mounted activity cage

The cage is triangular in shape and rests upon three drums, one at each corner. These are connected so as to convey changes in pressure to a Marey drum. A signal magnet and marker, connected to a timing device, marks off the desired time intervals. (From Richter, 1927; in *Handbook of Psychological Research on the Rat* by N. L. Munn, Boston, Houghton Mifflin, 1950, p. 55.)

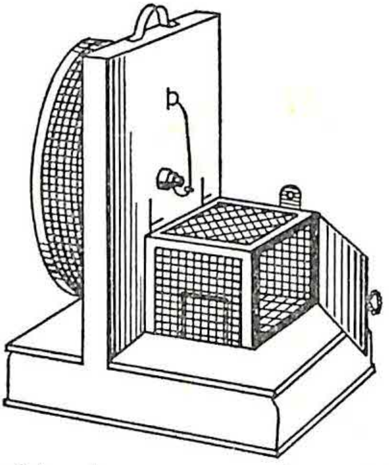

Fig. 2. Revolving drum apparatus for studying activity

The rat lives in the cage at the right of the apparatus. When it runs in the revolving drum at the left, revolutions in both directions are recorded by the cyclometer. There is a sliding door, not seen in the figure, by means of which the rat may be kept in the revolving drum or prevented from entering it. (From N. L. Munn, see Fig. 1, ibid., p. 53.)

constant in the rat between 6 and 9 months of age. We also know that activity diminishes after a certain age (Richter, 1927).

Individual differences in general activity in man are considered an important feature of personality. Heymans and Wiersma (1906), examining one of the three dimensions of their typology, measured the degree of activity by the tendency to do all sorts of jobs during one's free time and after working hours (questionnaire method). Factorial analysis also treats activity as a basic factor in several studies (*vide inter al.* Guilford, 1939; Koch, 1934 and 1942). Gesell and Amatruda (1941) studied it from the genetic point of view.

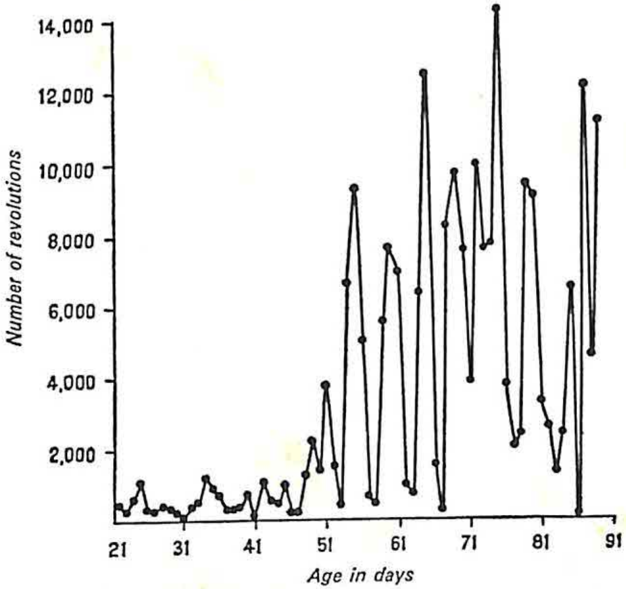

Fig. 3. Appearance of cyclical activity at puberty

Activity is at a low level until puberty. At the onset of puberty, however, activity not only shows an increase in general level, but it also begins to display a rhythm corresponding to the female's sex cycle (the cycle has a periodicity of 4 to 5 days). Activity is at its maximum during the period of sexual receptivity. Activity is measured by the number of revolutions in the revolving drum. (From N. L. Munn, see Fig. 1, ibid., p. 67.)

2 *Explanation in terms of energy*

There is no doubt that the capacity for activity or energy of an organism depends in the last analysis on the chemical sources of energy provided by food of all types. Nevertheless it would be illusory to maintain that dynamic factors of behaviour stem directly from this metabolic energy, although this is what some authors claim. Holt (1931), whose work *Animal drive and the learning process* had a wide influence says: 'As it is the energy of gasoline or other fuel which drives the internal combustion engine, it is as clearly the chemical energy of food taken into the body which somehow drives the animal organism. So long as psychology persists in disclaiming responsibility for describing the connexion between the activities of an animal and the food which he has swallowed, it will of course continue to find the problem of animal drive vexatious.' (Holt, 1931, p. 8.) This is true in so far as the general activity of an organism depends on the very fact of being alive, but it does not explain the variations in this activity. In fact, we have just shown that, contrary to the action of petrol in the motor, food deprivation increases activity. Moreover, no direct relationship can be established between metabolic energy and most types of human motivation. The desire to attain respect from oneself or from others, for example, does not seem to be related to metabolic energy. This use of chemical energy derived from the metabolic process to explain motivation exemplifies the danger of using the word energy in psychology without due regard for its original meaning (*vide supra*, p. 5).

From the point of view of studying motivation, laboratory experiments on general activity omit an essential feature, since the animal's activity is measured without reference to the search for an objective. But in everyday behaviour, the increase in activity which characterizes the beginning of a state of need implies a vague orientation of search, which may be compared with the 'trial and error' attempts when one begins to learn: these groping activities have a certain orientation and are by no means fortuitous (Krechevsky, 1932; Tolman and Krechevsky, 1933).

In conclusion, it may be noted that certain authors consider general activity to be any conduct not set in motion by one or other of the important physiological needs, such as taking a walk, washing, remaining seated, etc. Bindra (1961) observes that a major part of animal behaviour consists of activities of this kind: he underlines the importance of what he calls the *general activity* of the animal. It would be more fitting to see whether some types of behaviour do not result from specific motivation, as has been shown for perception, manipulation and exploratory activities (*vide infra*, pp. 34–45).

4 Incentives

Motivated behaviour is actively directed by positive or negative incentives. Many studies have been made to define the sensory qualities and objects preferred by certain categories of subjects in defined circumstances.

1 Incentive and organic need

Those authors who studied motivation principally in terms of organic needs thought that the organism was drawn towards substances for which it had a biological need. A physiological need would thus be reflected in a tendency or impulse of a well-defined kind. As Darwin remarked, it is obvious that this hypothesis must hold true to a certain degree for the animal to survive. The organism is, in fact, drawn towards certain nutritive substances, and, independent of their nutritive value, certain foods are preferred to others, according to the different animal species.

Experiments by Harris, Clay, Hargreaves and Ward (1933) confirmed the hypothesis that the selectivity of nutritive behaviour was determined by biological need. Rats fed for several days on food lacking in vitamin B and subsequently given a choice of food with or without vitamin B rapidly learnt to prefer foods containing vitamin B.

Richter and Young made a complete study of animal preferences in terms of certain specific needs of the organism. Using rats whose adrenal cortex had been removed, Richter (1936) observes that these animals, who normally die from lack of salt a fortnight after the operation, are able to remain alive through the absorption of vast quantities of salt water supplied to them. Faced with a bowl of ordinary water and a bowl containing a 3 per cent saline solution, the operated animal chooses the saline solution which it would normally refuse. In these conditions, the animal is able to absorb 15 times the normal dose of salt.

In another series of ingenious experiments, Richter (1942) uses different nutritive substances such as protein, fats, iron, salt, etc. He observes that the animal generally prefers the food it needs biologically. It may be supposed that the attraction of these foods lies in alterations in the animal's tastes; however, section of the nerves of the taste organs removes any preference for salt solutions (Richter, 1942).

Young (1948) emphasized the fact that certain foods and solutions are, by their very composition, preferred by the animal independently of its state of need. He shows, for example, that the adrenalectomized rat as well as the normal animal prefers a 0·7 per cent salt solution when given the choice between eight different salt solutions varying from 0·1 to 12 per cent. Young used the idea of *palatability* to indicate the preference for certain foods not because of organic need but because of the nature of the nutritive stimulus itself (*vide infra*). In French psychological literature, we would refer to Le Magnen's work on the role of smell and taste in the choice of foods and the quantity absorbed (1959).

Moreover, organic needs do not always produce selective behaviour. For example, Young (1941, 1948) demonstrated that animals suffering from lack of vitamins A and D were guided in their choice by a preference for sweet foods, although acid foods were more suitable to their organic needs. It may thus be said that the organism does not always seek the substances it needs biologically. Moreover, certain harmful substances are coveted particularly by man, and less so by the lower species.

2 *Criteria*

What are the objects and situations which have a positive or negative incentive value for the individual? We may expect these incentives to be very different according to the species, and past experience or learning will play an important role. Social, cultural and individual factors appear to influence the development of these incentive values in man. Something which attracts one person may produce no response in another or may even be rejected. Psychology and cultural anthropology have demonstrated this in different cultural groups. Cardinet gives examples in his work on aesthetic preference in terms of personality (1958), and Peryam in work on food preferences in the American Army (1960). Moreover, affirmative studies on human and cultural values have multiplied during the last few years (*vide inter al.* Morris (1956) and Pepper (1958)).

The concept of incentive value involves that of tension or tendency. It is through this tendency that an object or a situation acquires a positive or negative incentive value. However, no state of tension may appear to exist previously in the individual and so the initiative seems to come from the object itself. The object may be regarded as awakening latent tendency, so that a previously unknown object or situation may provoke exploratory or manipulatory behaviour in certain species of living creatures (*vide infra*, p. 37).

The experimental study of incentive values has been chiefly concerned with measuring the relative importance of reward and sensory pain. The criteria used were: (1) the preference for one object rather than another; (2) the quantity consumed (for example, food of a certain flavour); (3) the degree of learning or of progress in attaining the object; (4) the size of the obstacle or the difficulty (e.g. electric shock), using the obstruction method, which the subject overcomes in order to attain the object.

Only one kind of research will be mentioned here, that carried out by the obstruction method, in view of its importance in the study of conflict. The preference method is illustrated by the experiments of Richter and of Young just referred to: whilst the influence of motivation on learning and on performance in general is dealt with elsewhere (*vide infra*, p. 30).

3 *Incentive and obstacle*

A) The apparatus generally used in obstruction experiments with animals is the *Columbia University obstruction box* (Warden, 1931) based on methods used by Moss (1924) (Fig. 4). The animal is placed in the entrance compartment A; as soon as he is to leave, door d_1 opens and he is faced by a fairly long passage too low and too narrow to jump. This passage is fitted with a mildly electrified grid, the obstruction element. E is the release plate in compartment C. Door d_2 opens automatically as soon as the animal runs on the release plate E (except in delayed reward experiments). The object having positive incentive value is found in compartment D (for example, food or an animal of the opposite sex, according to the motivation under study). A standardized procedure is generally used to compare the results obtained in different experiments. After the animal has made four crossings without obstruction (that is, without the grid being electrified) so as to familiarize itself with the apparatus, the experiment is begun and usually lasts 20 minutes. When the animal reaches compartment D, where it finds the reward, it is brought back to A. The result is usually assessed by the number of crossings made in the course of a 20-minute experiment.

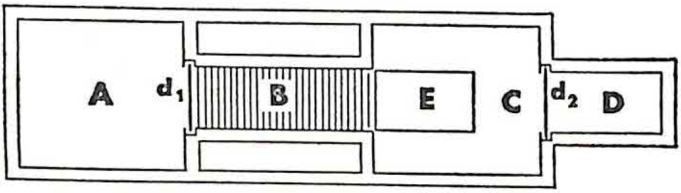

Fig. 4. Floor plan of Columbia obstruction cage

A, Entrance compartment; B, obstruction compartment with electrified grid; E, release plate; C-D, divided compartment containing the bait; the bait is placed in D and this part of the compartment is closed off by an automatic door (d_2) which is operated by pressure on the release plate. Compartment A is separated from compartment B by a manually operated door (d_1) which the experimenter opens when he wants the animal to enter the obstruction compartment. (From *Introduction to comparative psychology* by C. J. Warden, T. N. Jenkins, L. H. Warner, New York, The Ronald Press Company, 1934, p. 533.)

B) Warner (1927, 1928a, 1928b) carried out a series of classic experiments by this method (*Columbia study*) and demonstrated its validity by proving that using a food-deprived animal with food as a reward, the number of crossings increases in proportion to the length of the period of deprivation (Fig. 5). He obtained a curve showing a maximum of 18 crossings in 20 minutes for animals deprived of food for 2, 3 and 4 days. After the fourth day the number of crossings decreases because of the animal's general weakness (8 crossings after 8 days' deprivation). Using sexual need as the motivation and a receptive female in compartment D, the number of crossings reaches the maximum after one day's continence (13 crossings) and varies little during a 28-day period (12 crossings after 8 days and 11 crossings after 28 days). As regards thirst, the maximum number of crossings is also reached after one day (21 crossings) and decreases more quickly than for hunger (on the last day of the experiment, the sixth, there are still 7 crossings).

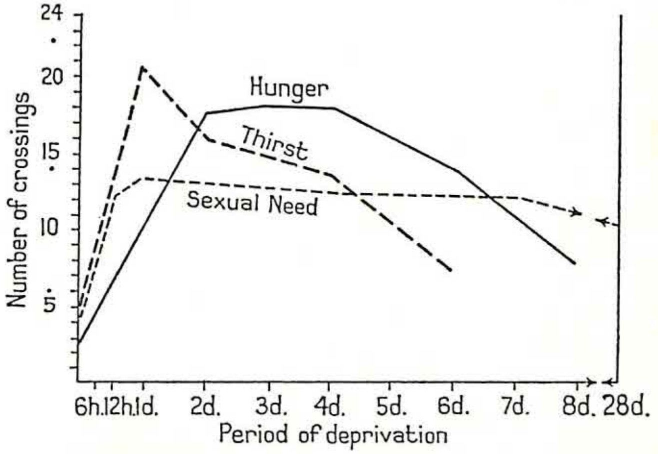

Fig. 5. Persistence of activity in an obstruction situation.
(Columbia Study: see Warden, *Animal Motivation*, New York, Columbia University Press, 1931, cf. p. 391.)

The curves represent the different incentives used; thirst and hunger scores are based on males and females combined; the curve for sexual need concerns males only. The various periods of deprivation are indicated on the abscissa and the average number of crossings in a 20-minute period on the ordinate. (From N. L. Munn; cf. Fig. 1, ibid., p. 95.)

C) In Warner's research the incentive value of the object is calculated in terms of the length of deprivation; the intensity of motivation is measured in terms of the persistence of activity, that is, frequency of crossings over an obstacle of constant difficulty. Fletcher (1940), using a different obstruction technique (shifting obstacles of different weight), showed that chimpanzees shift heavier weights in proportion to the size of the piece of banana in view.

D) In a very interesting group of studies, Hamilton (1929) showed that the incentive value of an object greatly decreases if a pause of 15, 30, 60 or 180 seconds is observed between the animal's crossing the obstacle and access to the compartment containing food (Fig. 6). All animals are deprived of food for 48 hours prior to the experiment. A pause of 15 seconds decreases the number of crossings by 43 per cent. There is no noticeable difference in effect between a pause of 30 seconds and a pause of 60 seconds, but a pause of 3 minutes decreases the number of crossings by 73 per cent compared with the non-delay group. These data, which require supplementing with experiments on a large variety of animals and children of different ages, show the important connexion between the problem of the pleasure principle and man's ability to defer immediate satisfaction in order to obtain rewards later. (*Vide* Spence, 1956, on the importance of delay of reward in general.)

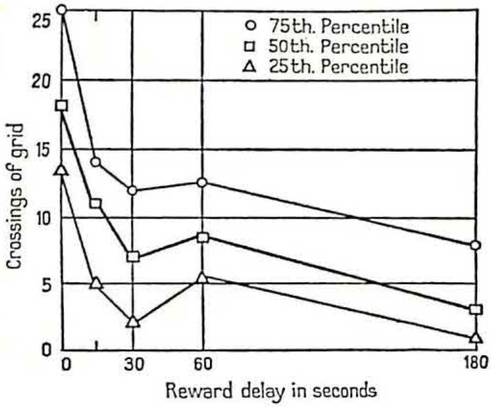

Fig. 6. Effect of delayed incentive or reward on the number of crossings of an electrified obstruction.
(From Hamilton, 1929.)

After the rat has crossed the electrified grid of the obstruction box, he was delayed a certain time (indicated on the abscissa) before obtaining the food. The curves show the influence of the different delay times on the number of crossings in a 20-minute period (net, delay time not included). The intermediate curve gives the median result and the other two curves indicate the 75th and 25th percentiles respectively. (From *Experimental Psychology* by R. S. Woodworth and H. Schlosberg, New York, Henry Holt and Company, 1954, p. 664.)

4 *Negative incentives*

With regard to negative incentives, suffering or anything giving pain releases in the individual an instinctive or innate flight reaction. Piéron states (1941, pp. 103–4) that the general tendency is withdrawal of the organism from sources of painful experience. It has also been proved that regardless of any learning and even despite prolonged habituation, certain sensory qualities are disagreeable. Sweet substances have a positive incentive value for almost all animals, while acid substances are avoided. Warren and Pfaffmann (1958) observed that habit does not change this negative incentive value. The same is true with vibratory sensations. Hung and Quay (1961) bred rats on continually vibrating tables. The subjects of the experiment are placed there before birth and remain there until the age of 56 days. When they are allowed either to continue or discontinue the vibrations by using a lever, they are observed to prefer the non-vibratory state despite habit. However, it is true that many objects only acquire a negative incentive value progressively. This is particularly true of man. The following cases illustrate this point. Anything forming an obstacle to the acquisition of an objective gradually takes on a negative incentive value, although the obstacle may itself be neutral (see experiments on conflict, p. 56). Under certain circumstances, satiation makes us reject the object with which we have had too frequent or too prolonged contact (*vide*, *inter al.*, Karsten, 1928 and Lewin, 1935, pp. 254–7). The process of reactive inhibition also shows that any recent reaction, especially if it required considerable effort, is afterwards avoided (Hull, 1943; 1952). Certain experiments on alternation and the exploratory tendency (*vide infra*, pp. 40 and 44) show that the place just traversed acquires as a result a certain negative incentive value in comparison with that which is still unexplored (this is relative negative incentive value). In more important cases still an object, first neutral or even positive, later repels the subject after learning or conditioning has taken place. The object provokes fear or anxiety since it represents the painful situation with which it was connected (*vide infra*, p. 51). The incentive value of failure is very complex. The task at which they failed exercises a certain attraction for some subjects (desire to make amends for failure), but creates a reaction of flight or avoidance in others. Fear of failure, differing widely with different subjects, has been demonstrated in a large number of studies (Hoppe, 1930; Rosenzweig and Mason, 1934; McClelland *et al.*, 1953). Gewirtz (1959a and 1959b) observes that subjects who avoid situations which are bound to be successful have a high I.Q. and claim to prefer difficult tasks, and do not recoil from failure. Finally, certain subjects have a tendency to exaggerate their failures, while others over-estimate their successes (*vide, inter al.*, Nuttin, 1953 and 1961, pp. 73–170).

5 *Incentive and nerve centres*

Direct stimulation of some nerve centres has positive or negative incentive value for animals. Olds (1954, 1955, 1958a, 1958b) observes that the rat with implanted electrodes stimulates itself when electrodes are implanted in certain regions of the brain (septal area) whereas it does not when they are implanted in other areas (e.g. lemniscus median). It may be deduced that stimulation of certain areas constitutes a reward for the animal. Olds showed recently (1958b) that the need for food increases the speed of self-stimulation when electrodes are implanted in the median and lateral hypothalamus; the sexual need (provoked by injection of an androgenic substance) has no effect in this case. On the contrary, the sexual need increases the rhythm of self-stimulation when electrodes are implanted in certain more lateral areas, and then the need for food has no effect.

5 Motivation and performance

Those branches of psychology primarily concerned with human performance and output recognized early on the importance of the motivational factor, which, next to aptitude, is the most important variable determining output. Striking differences exist between the performance levels of subjects of similar aptitude but dissimilar motivation (Young, 1936). Here we may see the effects of the general level of activity, which is a characteristic of the motivational state.

1 The formation of goals

The process by which the individual *sets himself a goal* is vitally important in the influence of motivation on performance. By analogy with 'plan formation', this process is known as 'objective formation', and both play an important part in human behaviour.

The objective of human motivation is frequently not an already existing physical object (e.g. food or sexual objective) but a certain level of performance or achievement which man seeks to attain or which he feels socially obliged to do. Even the pursuit of material objects for the satisfaction of physiological needs normally falls within the category of professional or social performance. To a certain extent, man sets himself the goals towards which he is motivated (*vide supra*, pp. 3–5).

A) *The beginning of the process.* Experiments on the level of aspiration have shed some light on this process of goal formation, and its origin is explained in several studies in developmental psychology (e.g., Bühler's studies (1931), Hetzer (1931) and Gottschaldt (1933)). A child of three likes to scribble with pencil and paper. He simply draws lines and obviously enjoys himself. His motivation sets in motion a series of motor reactions. Bühler and Hetzer (1927; 1928) observed that it is rare for a child of three to attribute any significance to his scribbles. If he does so—and this happens in only 10 per cent of cases—he always says afterwards *what* he has drawn. It is observed that some four-year-old children explain what the drawing will represent while the activity is still taking place, but others form a definite idea and state *what they are going to do* before beginning. Eighty per cent of five-year-olds work out their plan before they start, and all six-year-olds do this. What is true with regard to drawing is also true in all other fields of activity. The higher organism operates not only on the 'executive' action level but also on the level of cognitive representation and *sets himself a goal.* This is one form of anticipatory behaviour of a motivational character.

To return to research on the level of aspiration that has systematically studied certain aspects of this process of goal formation:

B) *Level of aspiration*—the basic study on this subject is Hoppe's (1930) carried out under Lewin's supervision and forming the starting point for numerous experiments whose technique

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is generally superior to that of Hoppe himself (Jucknat, 1938;[1] Frank, 1935; Lezak and Raskin, 1950; Sutcliffe, 1952). But in view of the importance of the ideas elaborated by Hoppe from the analysis of his somewhat brief experimental data, they must be examined here in detail. Later results covering ten years' research were summarized by Lewin, Dembo, Festinger and Sears (1944) and a summary made in French by Guérin (1958); see also Robaye's research (1957).

Failure and success. Hoppe first shows that success or failure —'reward' or 'punishment' in Thorndike's terminology—cannot be defined in objective terms. The author states that in the cases he studied the subjects set themselves concrete goals at the outset, with the intention of attaining a certain level. This represents their level of aspiration (*Anspruchsniveau*); it is what they hope to achieve. It is the relation between this firm level of aspiration and the actual performance which determines whether the activity has resulted in success or failure. In one of Hoppe's experiments the subject is given rings to hang on hooks which are fixed on a moving belt travelling at an adjustable speed. The same objective result (hang 10 rings out of 16) might be success for one person and failure for another; what appeared to be success might be failure under other circumstances. Further, a result can only be a success or failure when the activity is regarded by the person as something which he has achieved himself and not something which is due to chance. Thus the types of activity about which someone is able to regard the result a success or a failure are fairly limited and more or less specific to each subject. Beyond these, that is as soon as the task becomes too difficult or too easy, the result is considered to be determined by the nature of the task itself. In one experiment involving a certain rapidity of reaction, the subject did not feel he had failed when the experimenter gave him less than 60 seconds to carry out the task, and when given more than two minutes he did not feel he had succeeded. It was observed in this experiment that the subjective success and failure limits were situated between 70 and 110 seconds. As soon as less or more time was allowed, *substitution* goals were observed (*vide infra*, p. 72) or escape conduct (play, etc.).

C) *Repetition and new objectives.* Concerning repetition of the same activity, it is important to note that, contrary to a certain idea of the law of effect, the subject does not repeat the same task because it led to success (*vide supra*, p. 19). His real motive for repetition may, for example, be the fact that he intends to try to hang two rings on each hook instead of one, or try another way of accomplishing the task. In other words, it is not a question of actual repetition, but a new task which he sets himself, which is directly connected with the study of the process by which man forms and sets himself new goals (*Zieldbildung*) depending on former success or failure. It is a type of learning and development which is not expressed in terms of reinforcement of associations. Straightforward repetition (characteristic of certain work) creates satiety and boredom which themselves create a motivation for change and exploration, or give rise to new behaviour and goals.

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[1] Jucknat's experiments were begun in 1931 in Berlin when Lewin was still there.

D) *Aspiration and expectation.* In these experiments Hoppe also distinguished between the realistic goal (*Realziel*) and the ideal goal (*Idealziel*) which the subject may confuse when expressing his level of aspiration. Festinger (1942a) obtains significantly higher figures when he asks subjects what result they 'aspire' to rather than the results they 'expect'. This difference is confirmed by Irwin and Mintzer (1942), which leads certain writers to speak of the level of *expectation* (Atkinson, 1950; Robaye, 1957). It should be noted, however, that in Hoppe's opinion (1930, p. 30) the *Anspruchsniveau* refers to the realistic goal.[1] The distance separating the ideal from the realistic goal is of the greatest importance in the study of personality, as Hoppe has shown.

E) *Initial level of aspiration.* The more or less constant differences in actual performance which characterize the fluctuations in the level of aspiration seem to be bound up with the dynamic personality structure. Hoppe's attention was first drawn to this fact as a result of certain differences and inter-individual constants in the initial level of aspiration (*Anfangsniveau*). Subject No. 19, who experienced one failure after another and was obliged to lower his level of aspiration during the test, began each new task with a higher level of aspiration than any other subject. Subject No. 14, on the other hand, who had an average number of successes, had the lowest level of aspiration in all tests.

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[1] The translation of the word *Anspruch* as 'aspiration' in English and in French has given rise to certain difficulties (cf. *infra*). Hoppe (1930, p. 10) speaks of '*Erwartungen, Zielsetzungen oder Ansprüche an die zukünftige eigene Leistung*'. The concept of concrete expectation is thus included in the term 'level of aspiration' as it was understood by Hoppe.

F) *Level of aspiration after success and failure.* The displacements of the level of aspiration after knowledge of the result effectively obtained are more important than the initial level (which is excluded by most later experimenters; *vide* e.g. Frank, 1935). Hoppe carried out the first important research on this aspect also, and his results were, on the whole, confirmed by later workers. Generally speaking, in our culture the level of aspiration rises after success and drops after failure. Out of 165 cases, Hoppe counts a 32 per cent increase in level of aspiration and 0 per cent lowering after success, with 3 per cent unchanged. After failure there is a 27 per cent drop, no increase and 12 per cent unchanged (the others stop working, begin another occupation, etc.). Jucknat (1937), using an improved and slightly different technique, notes higher percentages of increase after success (96 per cent, 80 per cent and 55 per cent, according to whether it is a very good, moderate or slight success); after equivalent degrees of failure, a drop is observed in 88 per cent, 80·5 per cent and 78 per cent of cases. The complementary percentages are quite the opposite, because the maze technique which the author used requires the subject to choose as his next activity a maze either one degree more or one degree less difficult, so a static aspiration level is made impossible. An interesting conclusion to be drawn from several studies is that subjects brought up in western culture almost always aim at a higher goal than that which they reached in the previous task. This enables one to make comparisons with other civilizations on the process of goal formation.

G) *The level of the ego.* Hoppe also analyzes the precise way in which subjects raise or lower their level of aspiration. Certain inter-individual constants lead once more to the conclusion that it is related to the dynamic structure of the personality. To that end Hoppe worked out the concepts of the 'level of the ego' (*Ichniveau*) and the 'awareness' or 'conception' which the ego has of itself (*Selbstbewusstsein*). This is a similar idea to that of *self-concept* and Hoppe's meticulous analyses have made the study of aspiration level a highly valued method of investigating the personality experimentally (*vide* e.g. Murray, 1938; Rotter, 1942a and 1942b). It should, however, be noted that the degrees of generality and consistency of results in this field are not always very high. When the difference between the result of a certain test performance and the level which the subject intends to attain in the following test is measured (this being known as the *goal discrepancy score*), the correlations between these measurements in two series of tests with the same subjects are between 0·26 and 0·75 (Frank, 1935a) and even between 0·04 and 0·44 (Gould, 1939).

H) *Miscellaneous applications.* The level of aspiration has been studied in relation to children's age (Anderson, 1940; Gottschaldt, 1958), to group performances (Hertzman and Festinger, 1940; Shelley, 1954; Nuttin, 1962), to the need for achievement and risk-taking behaviour (Atkinson, 1957, 1958), etc. It is especially interesting to observe that different categories of pathologically disturbed and anxious people show great variability in their aspiration levels. The Maudsley Hospital group, London (Eysenck and Himmelweit, 1946; Himmelweit, 1947) showed that neurasthenics and dysthymics tend to set themselves higher levels than normal people, while hysterics have a very low level of aspiration; it often happens that they set themselves a lower level than that which they have just reached.

2 *Motivation and products of imagination*

A) *Psychogenic needs.* Researches on the level of aspiration study motivation on the plane of real, conscious activity. Some authors considered the study of products of the imagination provided a better means of investigating motivation. In this they were inspired by Freudian theories on the role of dreams and the mechanism of projection, as well as by certain research on the imaginative or projective element pervading perception. Two groups specialized in examining the products of the imagination, the first being that of the Harvard Psychological Clinic under Murray's direction (1938). Sears, Rosenzweig, MacKinnon Sanford, Frank, Beck, Ovsiankina and White all worked there during the thirties and forties, and carried out important work in the field of motivation. The classical work of this group (Murray, 1938) opened up new paths for the study of motivation and included, among other things, the first research using the thematic apperception method, which brought to light certain specifically human needs (psychogenic) such as, for example, the *need for achievement* (n Ach) the *need for affiliation* (n Affiliation) the need for knowledge, the need for exploration, etc.

B) *Need for achievement.* The second research team, while not completely independent of the first, was grouped around McClelland's work (1953) on the need for affiliation and, more particularly, the need for achievement. The present state of these studies was summarized with an abundant bibliography by Atkinson (1958).

McClelland's technique (1953) requires that in the first phase of the experiment the need should be stimulated by the deprivation method, as for biological needs. Differing degrees of hunger are produced by depriving the subject of food for a certain period, and McClelland first believed he had found an analogous method of privation for the need for achievement by creating defeat experimentally. Gradually the importance of cognitive factors implicit in the instructions given to the subject was better understood. The need for achievement was 'produced' by McClelland in six conditions of varying intensity. The subjects (university students) were required to carry out tasks for 12 minutes (anagrams, etc.); the instructions given produced either a situation without importance or personal responsibility, or *stress* conditions (measurement of their intellectual capacities and social aptitudes) followed by failure or success. In these conditions the subject is then given, without transition but by a different experimenter, a test of creative imagination (of the TAT type) in order to obtain a pattern of the ideas and images (*thought sampling*) created by the different intensities of the need. The four plates of the standard series used in this test represent: 1. The scene of father and son, taken from Murray's TAT; 2. A young man with a vague operation scene in the background (ibid.); 3. Two men working at a machine in a workshop; 4. A boy seated at his desk with a book open in front of him (the two latter scenes are new). The subject's interpretation is expressed in the form of replies to four questions: 1. What is going on and who are these people? 2. How did this situation occur; that is to say, what happened before this scene? 3. What are their thoughts and desires—who thinks what? 4. What is going to happen? What are they going to do?

A technique of evaluation of the subject's interpretations was devised. (A more recent description of this technique is to be found in Atkinson (1958) pp. 177–241 and pp. 685–837.) Everything which, in the subject's imaginative interpretation, shows any interest or affective evaluation about the characters in the scenes is noted—for example: 'He wants to become an important manufacturer'; 'He is unhappy because he has failed in his examinations', etc. The overall result for each subject forms an *index of performance* which sums up the values for each category of imaginative element connected with the need for achievement.

C) *The index of performance in male and female subjects.* Among male students, the index of performance rises in relation to how much the need for achievement is stimulated in the immediately preceding test. This was confirmed by later research on a wider population of young male subjects (Veroff *et al.*, 1953), as well as among Navaho Indians. However, this is not the case with young female subjects whose index remains at the same fairly high level independent of the motivational conditions of the preceding test (Veroff *et al.*, 1953). The need for achievement among female subjects seems to be more influenced by their degree of social acceptance (McClelland, 1953). It is believed that a relation between a high degree of need for achievement and family atmosphere exists: an atmosphere of individualism and independence intensifies the need for achievement in boys. There is a negative correlation of −0·56 between the degree of need for achievement in a boy and his conception of his father as 'helpful' and 'friendly'. The correlation is −0·39 for the mother (McClelland, 1953).

D) *Validity of the index.* The essential problem is to know whether the index of performance based on the subject's imaginative products may be regarded as a valid measure of motivation. This remains fairly problematic for the following reasons: the correlation between a first result and a retesting one week later is neither high nor significant (0·22 in a group of 40 subjects). No correlation exists between the degree of motivation as deduced from McClelland's index, and the clinical judgment on the same trait among the same subjects after a psychological and psychiatrical examination by a third party. Nor is there any correlation between it and the subject's judgment of his own motivation. On the other hand, the index is certainly important because of its significant correlation with several fields of activity. Lowell (1952) observed considerable progress in achievement in a group of subjects with a high index during five consecutive four-minute test periods, whereas a group with a much lower index made no progress (t = 3·76). The number of arithmetical operations carried out by the first group was also noticeably higher than the second (t = 2·40) (Fig. 7). Subjects with an average index tended to be more preoccupied with their security (they showed a tendency to run away from failure), whereas those with a superior index were more prepared to take risks in order to achieve further success and reach a maximum level of aspiration (McClelland and Liberman, 1949). A certain number of studies (Atkinson, 1958) also showed that a subject with a high index tends to persevere to complete problems, has self-confidence in the results of what he has undertaken, tends to be ambitious in as much as he sets himself high goals and is capable of great efforts to attain them, shows no anxiety when faced by a task, is independent and prefers not to ask for help from others; moreover, the index correlates with the intellectual competence which was measured—for example, on a calculation test.

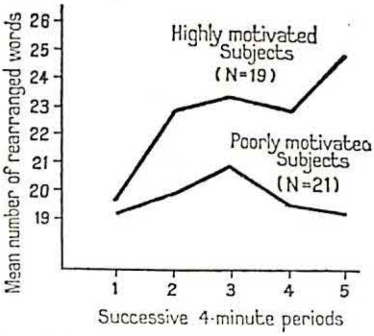

Fig. 7a. Results obtained by two groups of subjects with different levels of need for achievement in a word rearrangement test.

The subjects had to rearrange a nonsense series of letters until they had constructed a meaningful word. The output is shown for two groups of subjects working for 20 minutes. The high-need group shows a mean gain in output from the first to the last period of 5·32 words, whereas the low-need group shows a gain of only 0·43 words, a significant difference in gain of 4·89 words ($t = 3{\cdot}76$).

One may conclude that a higher level of need for achievement produces more effective learning in complex tasks where it is possible to make progress. (From *Studies in motivation* by D. McClelland, New York, Appleton Century Crofts, 1955, p. 407.)

It might be appropriate to ask whether measurement of the need for achievement without a preliminary period of stimulation would not give different and equally significant results more directly correlated with the motivation shown. McClelland's original belief that the need for achievement should be 'produced' or stimulated by a phase of deprivation as for hunger is not wholly true. It would then be possible to measure need as shown directly in any activity without going through the stages of training and stimulation. Studying the sensitivity of a subject's imagination in stimulating conditions is quite different from examining his normal degree of need for achievement. As to the validity of the analysis of the *imagination* in the study of motivation, one wonders whether the imaginative life of a normal man trying to achieve his desires through real actions does not contain less significant dynamic factors than that of a person who transposes his motivations into dreams (Nuttin, 1955, p. 169). That is why direct study of conscious motivation on the level of manifest behaviour seems more important in normal psychology than many psychologists appear to recognize (Allport, 1953).

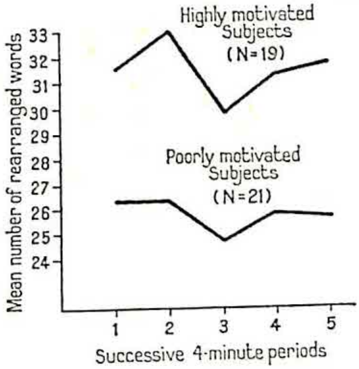

Fig. 7b. Results obtained by two groups of subjects with different levels of need for achievement in a simple addition task.

The number of simple additions made by the two groups are counted at the end of each of the five two-minute periods. The two curves show that the highly motivated group obtained a consistently higher output than the other group. The addition task is too simple to allow learning or systematic progress. (From McClelland, cf. Fig. 7a, ibid., p. 408.)

3 *Learning and performance curves*

A) We have already referred several times to certain progress and learning in the subject's reactions which vary according to the degree of motivation. The experiments described in connexion with the obstruction method also give many illustrations of the close relationship between achievement and motivation (*vide* pp. 15–17). Another problem is knowing whether the subject learns more quickly—if he makes greater progress from one test to the next—in relation to more intense motivation or a greater reward. Several experiments (Crespi, 1944, Zeaman, 1949; Reynolds, 1950) show that achievement is always greater when motivation or reward is higher (the rat runs faster, discriminates and chooses more rapidly, etc.), but progress from one test to another (*rate of learning*) does not increase in proportion to motivation (Fig. 8).

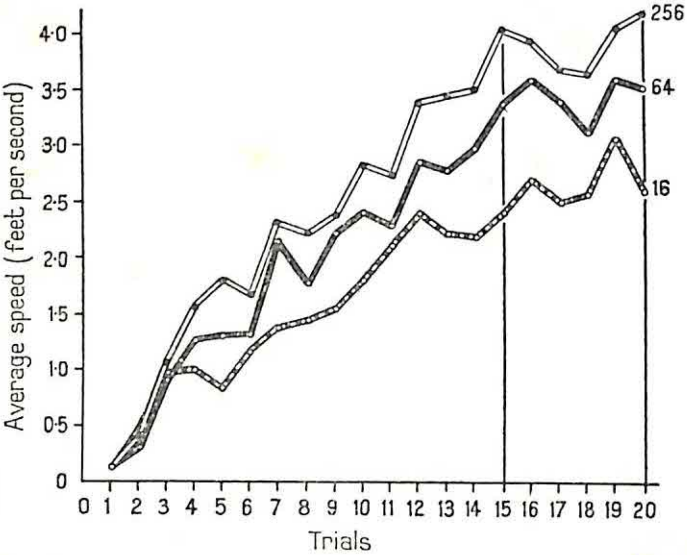

Fig. 8. Learning and performance level for three different quantities of food.

The quantity of reward given to the rats is expressed, for each of the three curves, in the number of small units of food (see figures at right of each curve: 16, 64, 256 units). Although the average speed of rats is greater among animals receiving greater quantities of food, the degree of progress or of learning during the 20 trials is the same in each curve. (*Psychol. Rev.*, 1944, 51, p. 349.)

B) Performance is affected not only by reward and punishment but also by removal or interruption of reward, that is by a type of *frustration*. Intermittent removal of the usual reward improves performance (*frustration-hypothesis*), as was demonstrated by Amsel (1952, 1954, 1958) and Wagner (1959). In an apparatus with two adjoining corridors, Wagner always feeds the three groups of rats at the end of the *last* corridor. In the entry compartment of the *first* corridor (which is also the starting point of the second corridor) one group never receives reinforcement, the second receives reinforcement during 50 per cent of the crossings and the third group are fed during the first 76 crossings and are then frustrated in 50 per cent of the remaining crossings. One hundred and eight trials are made by the three groups. Results show that the removal of food *at the end of the first corridor* during the last 32 trials by the third group of rats accelerates their speed in the second corridor. These data contradict Seward's hypothesis (1957) which states that speed is only relative. Seward believes that the reward at the end of the first corridor depresses the speed in the second corridor (*response-depression hypothesis*). When no further rewards are given at this point, this slowing-down disappears and relatively higher speed is attained. Wagner's results show that the first group of rats, which did not receive reinforcement at the end of the first corridor, run more slowly in the second corridor than the frustrated rats and their speed is comparable to that of rats in the other two groups, who received food at the end of the first corridor.

4 *Knowledge of results and motivation*

A) In a splendid series of experiments conducted in Professor Bartlett's laboratory at Cambridge, Grindley and his collaborators studied the importance of the subject's knowledge of the results he obtained during a series of successive tests (*vide* e.g. MacPherson, Dees and Grindley, 1948 and 1949). The subject holds in his right hand a knob about 2 inches in diameter and is required to turn the knob through 20° approximately and return it to zero in one continuous movement. He can see neither the knob nor his own hand. A scale allows him to observe after each attempt whether the movement was too great or too small. The experimenter can note the movements of the knob by means of a recording device. It will be seen from Figure 9 that the subject's performance rapidly attains a high degree of precision which is maintained as long as results are shown on the scale. When the subject is no longer allowed to see the results, the effect of learning is not maintained and, in fact, the curve immediately shows a

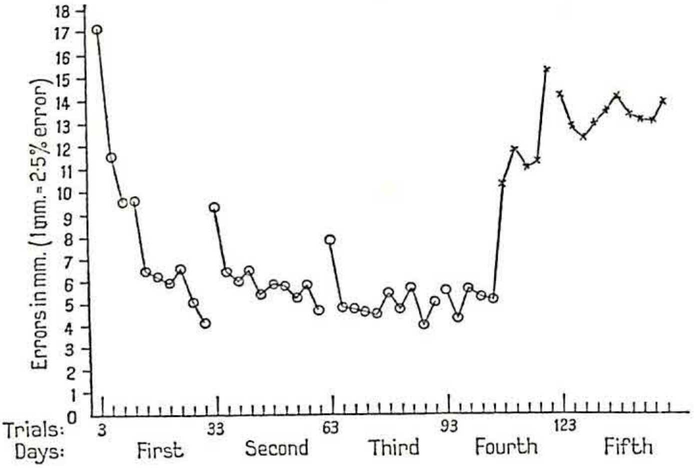

Fig. 9. Precision of reaction through knowledge of results. (Macpherson *et al.*, 1948 and 1949)

The circles represent the mean error (in mm) in the experiments with knowledge of results. The crosses indicate experiments without knowledge of results. Each circle or cross represents the mean error in a cycle of three readings for 12 subjects over a period of 5 successive days. There is an interval of 24 hours between each experiment. It will be seen that there is regression during the first trials on the 2nd and 3rd days but the previous day's precision is quickly recovered. As soon as the performance has been 'stabilized' (by the 4th day), the previous day's performance seems to be maintained (see first trial of 4th day which is at the same level as the last trials of the previous day). During the series of trials on the 4th day the subject suddenly received no more knowledge of precision of performance. There is rapid decline in the level of precision (see the first cross). The 5th day trials, also without knowledge of results, also show a very low level of precision. No improvement is shown during this last series of trials. (*Quarter. J. exp. Psychol.*, 1949, I, 169.)

sharp increase in error: the movements which were previously carried out with a 5-mm. margin of error now show deviations of up to 14 mm., and the subject's interest is observed to decline. As long as he sees the results of his work he is motivated to do well or even better. This should be examined in connexion with what we have just said about the level of aspiration. Knowledge of the result obtained permits the subject to set himself a precise objective each time and thus sustains his motivation. As soon as this knowledge is withheld the task becomes a blind and fortuitous activity. This throws special light on the relation between learning and motivation and particularly on the complex function of verbal 'reward'—which implies a communication of result—in experiments similar to Thorndike's (1932). This communication of results is valuable both from an informative and emotional point of view. (See other results confirming this interpretation; Nuttin, 1953 and 1961, pp. 353–8.) It should be added that it makes almost no difference whether the communication is made by a pleasant or unpleasant stimulus, as Muenzinger (1934) and others demonstrated later. An electric shock may quite well be used to inform the subject that his response is correct without the progress of the performance deteriorating.

B) The connexion between the 'knowledge of results' factor and the level of aspiration is also clearly demonstrated in several early experiments on fatigue. In an exercise in weight-lifting, the subject reaches a point where he feels he is making the maximum effort. As soon as he is told the exact point reached on the ergograph, he succeeds in surpassing his previous results by up to 13 per cent (Crawley, 1926; see also Wright, 1906). The communication of the result obtained has the effect of stimulating the subject to raise his level of aspiration and surpass previous performances. This precise aim of surpassing previous results makes him capable of extraordinary effort.

5 *Motivation, morale and productivity*

The considerable data furnished by studies in applied psychology on the influence of motivation in professional or industrial work or studying, etc. will not be set forth here (*vide* Viteles, 1953, and Coumétou, 1956, pp. 1141–55). Many experiments have been made on the influence of morale—that is, the general level of satisfaction and motivation of the workman—on his productivity. We will mention only the fact that the satisfaction or non-satisfaction of certain fundamental motivations seems to have an indirect repercussion on man's general output. An interesting experiment by Kahn and Katz (1953) shows, among other things, the effect of two methods of inspection and direction of workmen by the overseer. The detailed method of instruction, which removes the worker's initiative and feeling of self-determination, produces a lower output and morale than that produced by a method which indicates the task to be performed without giving detailed instructions for each mechanical movement. There seems to be a certain need for self-determination, which is the opposite of purely instrumental and mechanical function, and which influences even industrial work.

6 Motivation in cognition

Woodworth (1947) drew attention to a need which had hitherto received little consideration; the *will to perceive*. He quite rightly observed that our life in relation to its environment is dominated by motives such as the desire 'to see, to hear—to see clearly, to hear distinctly—to make out what it is one is seeing or hearing—moment by moment'. Nissen (1951, p. 357) applied the same views to animals, and noted that 'much of the daily activity of the rodent, the dog, the monkey or the chimpanzee consists in movements of the body and of the sense organs designed to keep the animal in touch with what is going on'. At the beginning of the century, McDougall (1908) noted that 'among the animals closest to man, that is, monkeys, curiosity (or the need to know) is very pronounced and not only impels the animal to approach the object and observe it attentively, but also to manipulate it' (pp. 49–50 of the 28th ed., 1946). Numerous experiments since 1950 have proved and analysed this in detail.

In an excellent critical survey of recent studies on exploratory conduct, Orsini (1957) traces the first studies and sporadic observations on this subject. Other summaries of this literature have been made by Berlyne (1958a and 1960), Butler (1958), Dember and Fowler (1958) and Glanzer (1958). See also the analysis by Dember and Earl (1957). The first systematic experiments on the subject of motivation in cognition are those of Berlyne (1950) and Harlow (1950), followed by those of Montgomery (1951) and Butler (1953).

1 Curiosity and new objects

A) In his first research, Berlyne (1950) introduces rats into an empty experimental cage which he allows them to explore for more than two hours. Returned to the same cage later the animals find three similar objects—three cubes for the first group of three rats; three cylindrical rings for the second group—which they are allowed to smell for two 5-minute periods. The essential phase of the experiment consists in putting the rats back into the experimental cage where one of the three familiar objects has been replaced by an unfamiliar object (two cubes and a cylinder for the first group and two cylinders and a cube for the second). The number of seconds which each rat spent on exploring (by smell) each of the three objects is recorded by a chronograph with three markers (the experimenter presses a knob during the time spent in exploring each object). The recorded exploration times up to 1 second for each of the six rats of the test group will be found in the first line of Table I. There is a significant difference between the exploration time of the familiar object and the unfamiliar one. After exploring the empty cage a control group of six rats was immediately faced with a heterogeneous collection of three objects (two cubes and a cylinder for one group, and two cylinders and a cube for the other). The difference between familiar and unfamiliar objects did not exist with the control group, as they explored each of the three objects for the first time. The number of seconds spent on exploring each object is noted in the second line of Table I. The significant difference between the exploration times does not occur here.

B) Berlyne (1954) also made a tentative experimental study of 'epistemic' curiosity in man (as opposed to curiosity on the level of perception). An experimental group of 34 university students are given a first list of 48 questions on 12 invertebrate animals (eight being more or less well known and the other four exotic). The subjects are required to carry out several operations concerning these questions, for example, to indicate the 12 questions whose replies interest them most, or the questions provoking surprise, etc. Then follows a list of statements of fact including amongst them the solutions to the questions in the first questionnaire; then the subjects receive a final list repeating the problems of the first questionnaire but this time phrased in such a way that they must complete the sentence with the aid of what they can remember of the preceding list (statements of fact). A control group (same number and type of subjects) was not given the first list of questions or required to carry out the operations connected with it. After indicating on a list of animals those which they know and those they do not, they immediately receive the list of statements of fact *without their curiosity being aroused* by preliminary questions. Finally they also receive the last list of questions to answer. The author measured the effect of curiosity by means of various memory tests and the introspective replies given by the subjects. He noted that among the experimental group the problems marked by the subject as interesting him are dealt with better in the final test, and the statements of fact (second list) which were recognized as replies to questions in the first list are remembered better. Finally, the data which provoke surprise are also better remembered.

TABLE I

Time (in seconds) *spent in exploring each of the three objects in a series in which* one *object is new.* (Adapted from Berlyne, 1950, Tables 1 and 2, p. 77–8)

	Group A 2 cubes and 1 cylinder			Group B 2 cylinders and 1 cube		
Subjects I to VI	I	II	III	IV	V	VI
Experimental group	8–7–2	0–4–1	0–2–1	4–1–3	1–3–1	1–1–2
Control group	2–0–0	7–12–9	4–7–7	2–3–2	7–2–6	3–8–2

The figures are given in the same order as the objects were placed in the cage. The figure for the unfamiliar object is given in bold type. The six rats of the experimental group spent 20 seconds on 2 familiar objects (an average of 10 secs. per object). They spent 22 seconds on the unfamiliar object (a difference of 12 seconds for the 6 rats or 2 seconds per animal). This difference is significant ($t = 3{\cdot}55$; $p = 0{\cdot}017$). There is no difference of this kind among the control group (average difference per animals $= 0{\cdot}17$). The average exploration time of 2 similar (and therefore familiar) objects in the experimental group is also significantly smaller than that of the same similar (and unfamiliar) objects among the control group ($t = 2{\cdot}27$; $p = 0{\cdot}046$).

2 *Manipulatory drive*

A) The first systematic research on the manipulation drive is Harlow's (see Harlow, Harlow and Meyer, 1950; and Harlow, 1950). The two works cited were undertaken on Rhesus monkeys and the manipulation object was a mechanical puzzle composed of three and six devices respectively (see Fig. 10). The first experiment with a three-device puzzle proved that during the 14 days of the experiment the monkey continued to be interested in the manipulation of the puzzle and that he learnt the exact way of taking the puzzle apart without any extrinsic reward. In the second experiment, Harlow studied more closely the progress and the limits of learning and interest by the monkey in this type of manipulation.

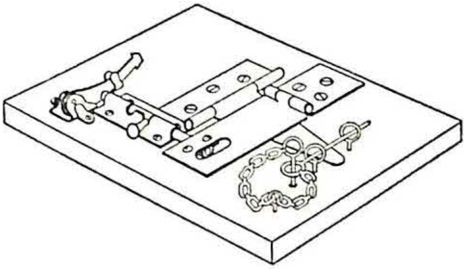

Fig. 10. Mechanical puzzle in 6 pieces.

The puzzle used in the first research (Harlow, Harlow and Meyer) was simpler and consisted of only 3 parts. (From Harlow, *J. comp. physiol. Psychol.*, 1950, 43, 290.)

He proceeded as follows: the mechanical puzzle (Fig. 10) is placed in the monkey's cage sited indoors. During the 12 days of the experiment the monkey has access to a larger outside cage communicating with the first. Five times a day (every two hours), the experimenter enters the cage and reassembles the puzzle which the monkey has taken to pieces. During the first five minutes of each period he observes the monkey's behaviour; he notes among other things the number of correct and incorrect manipulations of the puzzle carried out by the monkey during this time. The correct responses are those where the puzzle is opened or taken to pieces; when the monkey does not manipulate the pieces in the correct order or when he does not manage to open them, the response is incorrect.

Figure 11 gives the progress curve of two monkeys during the course of 12 successive days, and shows their incorrect responses in relation to their correct ones. The curve also shows that the monkeys learn without any extrinsic 'reward' (food, for example). Treated in another way, the results show that during the first six days the two monkeys made 63 and 82 correct responses respectively, as against 157 and 134 during the second six-day period (for the first 5 minutes of each period). The intensity of motivation and activity of the monkey shows itself in the fact that, during the last six days, 81 per cent of the pieces were in fact taken apart during the first 5 minutes of each period.

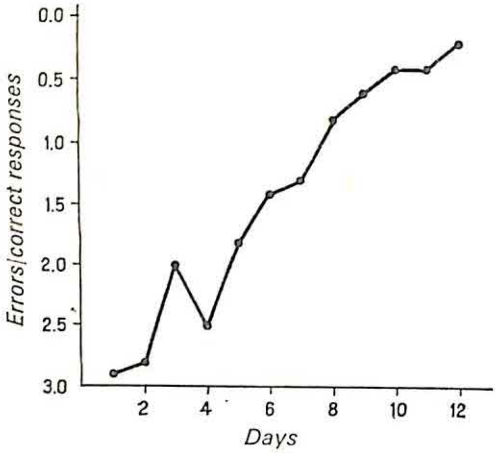

Fig. 11. Days–Learning curve (incorrect responses/correct reponses) for mechanical puzzle of 5 parts during a 12-day experiment.

NB.—The 6th piece of the puzzle (a hinge) frequently remained closed. The results of the 1st, 2nd and 4th days are significantly different from those of the 10th, 11th and 12th days on a $p = 0{\cdot}01$ level. At the end of each 2-hour period the experimenter entered the cage and recorded the number of opened parts. By subtracting from this figure the number of parts opened during the first 5 minutes the monkeys' output during the non-observation period is obtained. This figure also increased during the 12 days of the experiment. (From Harlow, cf. Fig. 10, ibid., p. 292.)

On the 13th day Harlow studies the phenomenon of satiety by showing each monkey the reassembled puzzle every 6 minutes for 10 consecutive hours (100 tests in all). A notable decrease in manipulations is observed, which reveals a phenomenon of satiety.

The fact remains, however, that each of the two monkeys takes apart almost half the pieces which can be taken apart (100 tests × 6 devices), that is, 286, thus demonstrating astonishing activity and sustained motivation.

B) *Primary need or derived tendency?* Regarding the explanation for this considerable degree of motivated activity, the authors in their first paper (Harlow, Harlow and Meyer, 1950, pp. 232–3) examined the possibility of a social motivation due to the presence of the experimenter at the beginning of each session. They concluded this was not so and even noted that, among the four monkeys taking part in the first study the departure of the experimenter had a more stimulating effect on two of them than his presence. Secondary reinforcement stemming from the need for food was equally excluded. Accordingly the authors concluded that there was a *sui generis* motivation for manipulation. Harlow (1950) also observed that the removal of certain parts of the brain had the effect of diminishing manipulative activity. Certain disciples of Hull's school continue to doubt the specific and primary character of the need for exploration and manipulation (see for example, on the subject, Brown, 1961, pp. 331–9). It should be noted that no one has yet studied the origin or development of this motivation in animals. In fact the precise modalities through which a new stimulus possesses or acquires a positive incentive value for the individual animal or human being are unknown. Among more recent research see, e.g. Bindra and Spinner (1958); Carr and Brown (1959); Ehrlich (1959).

C) *Ambivalence of the strange and unknown.* Under certain circumstances the unknown, the new and the strange produce negative reactions, even pronounced anxiety responses, rather than approach reactions. In other cases, there is a mysterious mixture of attraction and fear—the seduction of danger and adventure—which characterizes certain children's games and those adult activities which seek out the unknown. Wiehe (unpublished work cited by Lewin, 1935, pp. 261–4) studied children's negative reactions to an unknown and strange person. The author followed the growth of this behaviour which ranged from complete motor inhibition and intense excitement to progressive habituation depending on the distance of the stranger, the length of time he stayed and whether he was in front of or behind the child. Hebb and Riesen (1943) studied fear reactions in monkeys faced with certain strange or unusual situations. A chimpanzee brought up in isolation is not frightened the first time he sees a man, even though a human face must necessarily be a 'strange' object to him. However, the same chimpanzee shows fear at the sight of a stranger as soon as he has learnt to see and recognize a certain number of people. This cannot be explained by conditioning or generalization of a dangerous stimulus, since all the human faces he has seen have so far provided pleasant experiences. Even the fact that one of the people he knows wears a garment normally worn by another person he knows can provoke a fear reaction. On the basis of these facts Hebb (1949, p. 149) hypothesized that the dissonance between what was perceived now and formerly produces a certain disturbance of the cerebral processes, the effect of which is the affective release of fear. Certain recent experiments (Hung and Quay, 1961, also Warren and Pfaffman, 1958 and Meier *et al.*, 1960) throw doubt on the general value of this hypothesis. To sum up, the positive or negative incentive value of the unknown and unaccustomed remains a problem for 'exploration'.

3 The need to perceive and the need for exploration

The desire to perceive or explore visually is well illustrated by Butler's famous experiment (1953) with five Rhesus monkeys. The apparatus was a covered cage with opaque walls lighted from within by a 25-W. lamp. Two small doors in front (see Fig. 12) opened electrically as soon as the monkey pressed on one of them from inside. After a preliminary training period a blue card and a yellow card were placed in front of the doors, indicating which one would open automatically to pressure. This is visual discrimination learning. The only reward given to the monkey each time he pressed on the right door was the fact that he could look out of the open door for 30 seconds into the hall of the laboratory and see what was going on, after which a shutter dropped. When the monkey pressed on the other door, a small lamp went on and the shutter covering the two doors was immediately lowered. After each attempt, whether successful or not, there was a 30-second interval during which the two cards were interchanged in accordance with a pre-established routine, then the shutter was raised and the two cards became visible once more. The monkey had 5 minutes to react; if he had not done so within this time, the door opened from the outside, remained open for 30 seconds, the shutter was lowered and after a 30-second interval the cards could be seen once again. The tests may, of course, be carried out more or less rapidly, depending on the speed with which the monkey presses on one of the doors when the shutter was raised. Each animal made 20 trials a day for 20 days (five days per week).

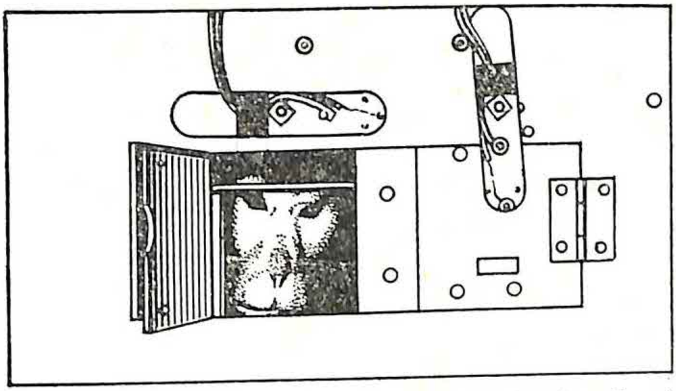

Fig. 12. Partial view of apparatus for study of visual exploration.

The apparatus is fitted with two doors opening and closing automatically by means of an electric switch. Through the open door is seen the head of the Rhesus monkey investigating his surroundings. (From Butler and Harlow, *J. comp. physiol. Psychol.*, 1954, 47, 259.)

The results, expressed in terms of percentage of correct replies, show that all the animals learn the discrimination test (see Figs. 13a and b).

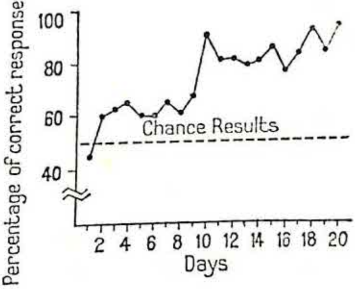

Fig. 13a. Learning curve for 3 monkeys in Butler's visual discrimination test of exploratory motivation.
(From Butler, *J. comp. physiol. Psychol.*, 1953, 46, 96.)

The authors also measured the reaction latency in terms of the time lapsing between the moment when the shutter was raised and the animal's reaction to one or other of the two doors. Individual differences existed among the five animals but the reaction latency increased only in one case out of five at the end of the experiment compared with the beginning. This particular motivation stands up well to the phenomenon of satiety (see also on this subject Butler and Harlow, 1954).

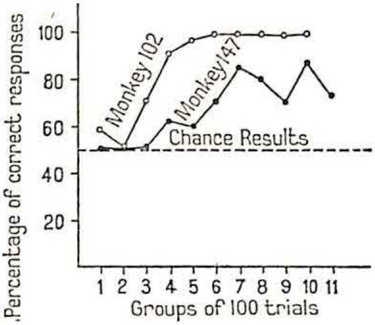

Fig. 13b. Individual learning curves for two other monkeys in Butler's visual discrimination test of exploratory motivation.

The progress of correct responses is indicated for 11 successive groups of 100 trials. Monkey No. 102 attains and maintains almost perfect performance during last 600 trials. Monkey No. 147, although inferior, attains significantly superior performances at the 50 per cent level ($p = 0{\cdot}01$). (After Butler, cf. Fig. 13a, ibid., p. 96.)

4 *Theoretical interpretation*

Harlow (1953a, 1953b) emphasized the opposition between exploratory motivation and homoeostatic needs. He stresses the antithesis between two types of need—those originating externally and internally. This opposition seems to be overstated if it is solely based on the external or internal origin of the motivation. In fact, ethological observations have shown the importance of the external object (*releaser*) without necessarily under-estimating the role of the organic or internal components in motivation. In fact, it is possible to consider motivation from the point of view either of the individual's 'disposition' or in terms of the object possessing incentive value.

However, it cannot be denied that homoeostatic and physiological needs in general are distinct from cognitive tendencies (tendency to exploration, perception and knowledge). One should regard the two kinds of needs and behaviour both as a kind of 'consummatory response' (Sherrington, 1906; 1947, pp. 329–33). Whereas homoeostatic needs are normally terminated by actions which produce a biological effect on the organism of the subject or its offspring, cognitive needs seem to be consummated by the object itself. The relationship which binds the organism to its surroundings implies, therefore, certain behaviour which shows that the organism, if sufficiently evolved, is capable of directing itself towards the object and interesting itself in it. This perhaps explains the powerful motivation of disinterested curiosity about things which characterizes man in some of his behaviour and aspirations, for example, in scientific activity. Kelly (1955, p. 4) rightly underlined the fact that this scientific attitude is perhaps not the exclusive attribute of a chosen few, and he suggests recognizing in each human being the existence of *man-the-scientist* who wants to understand things as they are, and *man-the-biological-organism* who is studied too exclusively by psychologists.

Certain authors have suggested an explanation of cognitive needs in terms of *tissue-need*, that is, physiological need. Nissen (1951) suggests admitting that every organ is self-motivating in that it has to exercise the functions of which it is capable. This is a characteristic of organic tissue. Cognitive motivation would stem from the needs of cell tissue in the brain and nervous system generally. Its function would be 'to know' and it would tend to act immediately on its knowledge. In many ways this recalls K. Bühler's *Funktionslust* (1930), although he did not use the concept of *tissue-need* to explain it. There is little doubt that some activities do occur because of a tendency towards exercise for exercise's sake, or function as an end in itself. Adler (1907, 1908) emphasized this motivation towards activity in organs; he speaks of a *Hörtrieb*, a *Sehtrieb*, an *Ernahrungstrieb*, etc. However, this type of motivation should not be generalized. It would be fanciful, for example, to explain the action of eating in terms of a tendency of the digestive tract to carry out its digestive function. Furthermore, were activity impelled simply by the organ's tendency to function, it would not explain the interest in the object itself or in objective knowledge. In other words, the physico-chemical activity of the nerve-cell and the act of knowing are not identical (Sherrington, 1951, pp. 247–8).

5 *Alternation drive*

A phenomenon connected with the need for exploration and also satiety is the spontaneous tendency for the animal in a maze, for example, to choose paths alternately. This phenomenon may be described as follows: an animal which, in a T-shaped maze, chooses the right-hand path the first time will most frequently choose the left-hand path the second time. This happens not only in experiments with no reinforcement, but also after a reward given at the end of the first path. Fowler (1959a and 1959b) amplifies this by observing that, in fact, small quantities of reward (food) do not decrease the alternation tendency, whereas a large reward decreases it considerably. In the latter case, the tendency to take the first path outweighs the desire to alternate.

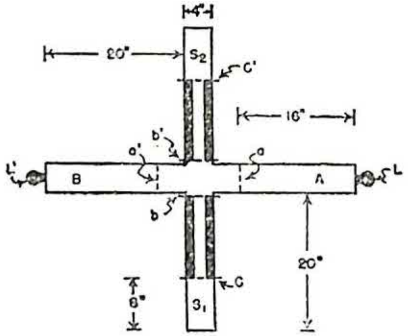

Fig. 14. Diagram of the apparatus for the study of spontaneous alternation. S_1 and S_2 are the two starting positions; A and B are the two goal-routes; *a* and a^1 are one-way doors; *b* and b^1, *c* and c^1 are sliding doors; L and L^1 are 7½-W. light-bulbs. The figures refer to inside measurements. (From Montgomery, *J. Comp. physiol. Psychol.*, 1952, **45**, 288.)

The alternation phenomenon was first observed by Tolman (1925) then studied systematically by Dennis (1935), Montgomery (1951, 1952a, 1952b) and many others (Dember and Fowler, 1958); it cannot be explained entirely in terms of reactive inhibition, as Hull tried to do. It is more closely connected with the search for new stimuli and the exploration tendency, as shown by Montgomery, among others. In fact, the phenomenon described is probably only the simplified form of something encountered in more complicated situations (e.g. in Dashiell's multiple-alley maze; cf. Dashiell, 1925), where the animal chooses the paths in such a way as to cover a large part of the network of the maze. In another type of maze, the cruciform maze with two entrances and two different exit compartments (Fig. 14), it is observed that the animal shows a marked tendency to go to each compartment alternately but not to turn first to the right and then to the left, as the principle of reactive inhibition requires (Montgomery, 1951b and 1952). In other words, the animal does not avoid repeating the same movement (e.g. turning to the left), but does avoid going two consecutive times to the same place and prefers rather to go to a place to which it has not yet become accustomed.

6 *Isolation and sensory deprivation*

Among experiments demonstrating that a need for external stimulation exists numerous works on isolation and sensory deprivation should be considered in addition to those on exploratory behaviour. For literature on this subject, see Wexler *et al.* (1958) and more particularly the symposium by Solomon *et al.* (1961). A resumé will be made here of only one study carried out on human subjects in Hebb's laboratory (Bexton, Heron and Scott, 1954). The experimenters ask their subjects to do nothing at all. Comfortably reclining on a couch in a silent room, they wear glasses to give a semi-transparent light without their being able to distinguish their surroundings clearly. Their hands are covered by cardboard cylinders to reduce tactile sensations to a minimum (Fig. 15). Physiological needs are satisfied normally and they receive in addition the princely sum of 20 dollars a day for doing nothing. Results show that after 12 hours' absence of contact with the outside world, the subject's mind fails to function normally and he becomes disturbed. Confusion in intellectual performance is observed during tests; hallucinations occur. Briefly, the subject cannot tolerate the absence of stimuli. Student-subjects in need of money even expressed their preference for difficult and boring work at 7 dollars a day rather than

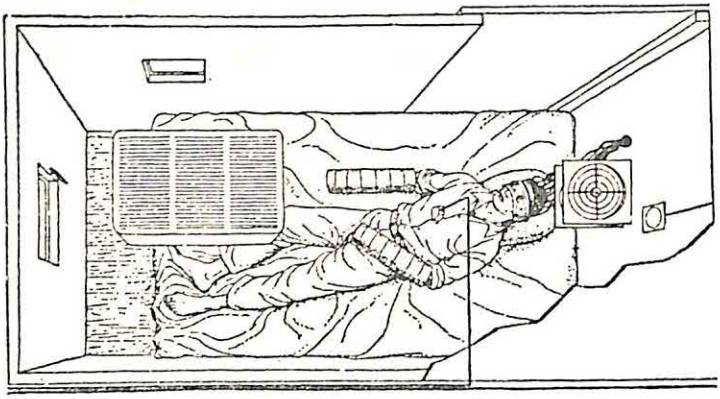

Fig. 15. Experimental cubicle for the study of perceptual isolation. (Hebb's laboratory.)

The diagram shows the cubicle from above with the ceiling cut away. The air conditioner is situated above the subject's feet and the exhaust fan is above his head. Also shown are microphone and speaker, and EEG leads. During part of the study the subject's head was placed in a U-shaped foam rubber headpiece. (From *Sensory Deprivation*, a symposium held at Harvard Medical School, Cambridge, Harvard University Press, 1961, p. 9.)

continue the experiment for which they were paid 20 dollars a day, but during which they were deprived of the outside 'world'. This gives an idea of the intensity of the need for contact with objects. Mental inadequacy in children deprived of affective human contact have been demonstrated in the studies of Spitz and many others (*vide infra*, *Social Motivations*, p. 46).

7 Social motivation

1 The search for social contact

Many interpretations have been offered for the fact that the individual often seeks the company of one or more of his own species. The contact sought may assume various forms. (On sexual contact and ethological work on the social behaviour of animals, see Chapter 12 on Needs.) Authors such as McDougall (1908) attributed this to a gregarious instinct, but social motivation now tends to be regarded as being derived from certain physiological tendencies by secondary reinforcement. The individual seeks the company of others because this company has satisfied his need of food. By a process of generalization, the bond which unites an individual to another who has satisfied his needs is extended to others of the same species.

There is much data in favour of this explanation. It is observed, for example, that a ewe does not necessarily follow another sheep or the flock by innate instinct; if a human being has taken care of and fed it, it becomes attached to this person and will never again be an integrated member of its flock. Ethologists have offered many explanations for the 'releasers' of this behaviour and the period during which these bonds become established (*Imprinting*).

Regarding human beings, the fact that the child finds satisfaction of his many needs through the adult doubtless creates very special affective bonds between them. However, facts show that to explain the social tendency in terms of satisfaction of primary needs is not plausible. It is observed, for example, that after a certain age the child does not seek the company of adults as much as that of play-fellows who satisfy none of his organic needs. Anderson (1954) and others emphasized the need to consider other factors. After a period during which the child plays by himself with the objects around him, a phase follows when he likes 'to do something' *with others*. The company of others is positively sought in order to play a game whose complexity increases with age (see also L. Murphy, 1937, 1943).

Spitz's systematic observations (1945) tend to show that the satisfaction of organic needs actually does not suffice to develop social contact in children. Although during hospitalization the child receives all necessary care and the satisfaction of 'primary' needs from adults, large gaps in the social and emotional contacts of the child—and even in his intellectual and physical development—become apparent through the mother's absence. A more complicated network of human interaction would therefore seem indispensable and valuable *sui generis*. (See also criticisms of Spitz's work: Pinneau, 1955, and Spitz's reply, 1955.)

2 *Affective value of the human face*

The value and specific significance of human contact, independent of the satisfaction of physiological needs, is more clearly shown in the study of the child's first emotional response to the human face. This response is seen in the first social smile (as distinct from the *gastric smile* described by Gesell) at about two months of age.

Some authors have tried to explain this first emotional response in terms of conditioning through the satisfaction of primary needs or physical contact (Watson, 1924). On the other hand Charlotte Bühler (1927, 1928, 1933) who studied the problem with several associates, explains the social smile as a specific and primary reaction to the human face. Dennis (1935) tried to solve the problem by looking for the unconditioned stimulus of the social smile in twins brought up under experimental conditions. He did not succeed and concluded that there is no stimulus more primary than that of the human presence. Spitz and Wolf (1946) specified the parts of the human face which are essential for setting this reaction in motion.

Despite his negative result, Dennis continues to believe that the child smiles at the human face as if it were a signal for the satisfaction of one or other of his physiological needs. However, he failed to make the child smile at the sight of the feeding-bottle which had always been used for his feeds (Dennis, 1935, p. 220). According to Bühler's theory, therefore, the human face seems to represent an object of specific significance for the child. It is probably a question of receptivity *sui generis* which forms the basis of a primary social need in man. The child shows immediate signs of displeasure when the human face disappears, Spitz observed. None of this excludes the importance of the learning element in the development and frequency of the smile (see Bowlby, 1957, and Brackbill's doctoral thesis cited by Bowlby).

3 *Social determination of motivation*

The great variety of motivations which man develops as a result of cultural and general social pressures has been studied principally by non-experimental methods (*vide* e.g. Klineberg, 1957, pp. 84–228; G. Murphy, 1954). The systematic observations of cultural anthropologists laid particular stress on the flexibility and adaptability of human behaviour (Mead, 1928), whilst more searching methods have recently shown, sometimes in concealed form, the existence of needs at first thought to be lacking (du

Bois, 1944; G. Murphy, 1954). Whiting and Child's study (1953) using extensive anthropological material, attempts to approximate more closely to ordinary experimental conditions. Their material, based on a hundred cultural groups, tends to confirm the influence on customs and habits of certain motivation processes, notably in making choices.

It may be added that the group dynamics method used in the study of 'small groups' approximates more closely to the strictly experimental method and it has already provided several interesting results on motivation. Some examples will be given farther on in this chapter (see pp. 60–62). The first inter-cultural study using an experimental technique was carried out in seven European countries by Schachter, Nuttin, de Monchaux, Maucorps, Osmer, Duyker, Rommetveit and Israël (1954). They studied the relation existing in a small experimental group between the threat of not being able to attain the goal assigned to the group on the one hand, and the aggressive tendencies towards (experimentally) refractory members on the other hand. From the methodological point of view, this study showed, among other things, the very different motivational significance of some experimental variables for cultural groups.

8 Negative motivation: avoidance of the object

The fundamental principle of Freud's theory of the libido is that the organism is driven to escape or stop any increase in stimulation or tension. This idea has had a profound effect on the conception of motivation in contemporary psychology (*vide infra*, p. 76). The effective starting point of this behaviour is the flight from pain rather than the pursuit of pleasure envisaged in hedonism. It may also be remembered that Freud referred first to the pain principle before coining the phrase 'pleasure principle'. Motivation considered as flight from pain, anxiety or fear profoundly affects the theory of personality and behaviour. Some psychologists interpret all motivation in terms of anxiety. For example, Brown (1953) explains that the desire for money is not a positive search for something one would like to possess, but rather flight from the acquired anxiety felt by man when confronted by lack of money. The same viewpoint is expressed by Mowrer (1952) when he states that anxiety is the only fundamental determinant of human behaviour at the ego level.

Most experimental studies on the subject of negative motivation concern either conflict (see p. 55), the influence of punishment on learning (see also the chapter on learning), or the learning process of anxiety of fear (p. 51). Other allied subjects, for example, are negative incentive values (see p. 19) and the process of reactive inhibition (see pp. 44–45).

1 Punishment

A) Starting with punishment as one form of negative motivation —it should not be confused with failure—two statements must be added to what has already been said. The object associated with punishment does not necessarily take on a negative incentive value in cases where it has formerly been used to satisfy a need. When a lever has been pressed successfully to obtain food, repeated electric shocks will not permanently deter the animal from using the lever, as it will return to it later (Estes, 1944). Its interest in the lever disappears only when persistent pressure no longer produces food. Punishment, on the other hand, does not discourage interest. Woodworth and Schlosberg (1954, p. 674) noted this among children and adults in general: 'Repeated punishment for an act does not deprive that act of its inherent fascination.' It is only when the act or the object is no longer felt to satisfy a positive need that it ceases to be of interest. With man, however, motivation is further complicated by the fact that the pursuit of the object, associated with the punishment, satisfies a need for opposition or independence.

B) On the other hand, the early experiments of Warden and Aylesworth (1927), confirmed many times since, showed that punishment helps the subject to avoid incorrect reactions by making him more attentive to the indications of environment each time that he comes to a decision point. Punishment therefore creates a motivation which makes the subject choose that particular type of behaviour we call 'prudent'.

The reader will note that a distinction should be made between 'punishment' in the sense of the intrinsic effect of an incorrect response and the extrinsic punishment attached, at a certain moment, to a reaction whose pleasing effect the subject has previously felt (as in the case of Estes' experiment). This ambiguity of terminology is often the cause of conflicting results in research.

2 *Anxiety and acquired motivation*

Fear or anxiety as an acquired motivation has been studied by several authors in terms of secondary reinforcement. Mention must first be made of Watson and Rayner's classical experiments (1920) on conditioning of fear (see Chapter 11). Other authors have more recently formulated the problem in dynamic terms. It is known that a painful stimulus produces an innate flight response (*pain drive*), but one wonders what causes avoidance of a situation previously associated with a painful stimulus (*avoidance learning*). Avoidance behaviour seems to be set in motion by an acquired motivation (*acquired secondary drive*), that is, fear or anxiety (as distinct from *pain* which is rather of internal origin). The works of Warner (1932) Mowrer (1938, 1940a, 1960) and N.

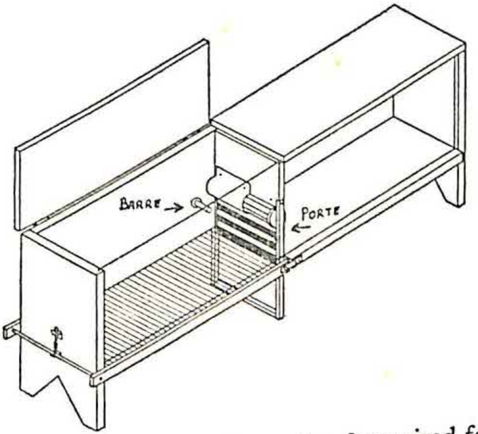

Fig. 16. Apparatus for the study of acquired fear.

The compartment on the left is painted white, the right one black. A shock may be administered through the grid which comprises the floor of the white compartment. The door separating the two compartments is indicated by horizontal lines. This door drops when the animal presses the bar or, in other experiments, turns the wheel. The experimenter can also make the door fall by pressing a button. The time elapsing between the rat's contact with the grid and his correct response is automatically recorded by an electric timer. (From Miller, *J. exp. Psychol.*, 1948, 38, 90.)

Miller (1948, 1951b) provide evidence and conflicting interpretations on this problem.

A) *Miller's experiment* (1948). The experimenter puts rats in a dual-compartment cage (Fig. 16); the compartment on the left is painted white and has a grid floor, the one on the right is black. A pilot study reveals no regular preference for either compartment on the part of the subjects. Miller then teaches the rats to be afraid of the white compartment by giving them an electric shock through the grid, the door between the two compartments remaining open so the rats can go freely from one compartment to the other, which they do very rapidly. This phase of the experiment is repeated ten times, after which the rats are placed five times in the white compartment without being shocked; however, they continue to run towards the black compartment immediately, as they did during the preceding stage. Miller states that it is possible that they continue to go to the other compartment out of habit. In order to find out if this is so, Miller considered it essential to discover whether the rat could be taught new habits because of its fear of the white compartment. For this purpose, the door between the compartments is closed (see

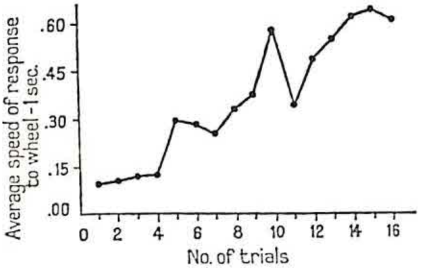

Fig. 17a. Learning the first new habit, turning the wheel, during trials without primary drive

The animals have learned to run from the white compartment through the open door into the black compartment as a result of receiving, in previous experiments, mild pain produced by an electric shock. In the following trials, without any electric shock, the door is closed but can be opened by turning a little wheel (see Fig. 16). Thirteen of the 25 animals succeeded in turning the wheel enough to make the door open at least 4 times in the first 8 trials. The curve shows the progressive increase in average speed with which these 13 animals ran up to the wheel and turned it enough to open the door during the 16 non-shock trials. (*J. exp. Psychol.*, 1948, 38, 94.)

Fig. 16) and only opened if the rat presses on a wheel making it turn a little. At the beginning of this new phase of the experiment the rat, being unable to escape from the white compartment, shows signs of fear (urinating, defecation, agitation) although it receives no electric shock. After a certain time the rat succeeds in pressing the wheel and the door opens. During the following attempts, still without shock, the rat reacts more and more quickly (Fig. 17a), until the experimenter alters the norms and the wheel's movement no longer operates the door. The rat then becomes agitated once more. Finally it presses a bar some distance from the wheel (Fig. 16), the door opens and it can go into the other compartment. Although there is still no shock during successive attempts, the rat progressively abandons the use of the wheel (Fig. 17b) and presses the lever more and more directly: it has thus learnt a second new habit (Fig. 17c).

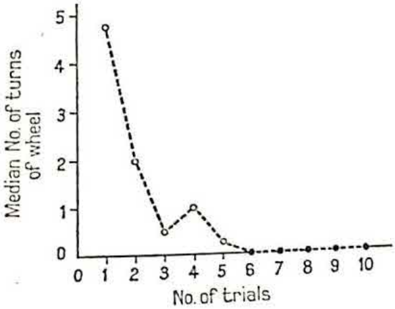

Fig. 17b. Extinction of the habit of wheel-turning.

When conditions were changed so that turning the wheel no longer made the door open to allow the animal to move from the white to the black compartment, the animals showed a progressive decrease in the response of rotating the wheel. Each point is based on the median scores of 13 animals. (Cf. Fig. 17a, ibid., p. 95.)

Miller concludes from this experiment that fear of the white compartment works in exactly the same way as if it were a primary need (hunger or thirst) in as much as it motivates the rat to learn new habits. For Miller this is proof that it is true motivation or *drive*; and, this fear of the white compartment having been learnt, it might be said that fear is a motivation or a need which may be acquired (*learnable drive*).

As to the extinction of the newly learnt habit, Miller showed that this takes a long time in establishing itself in certain subjects.

One of his rats, for example, continued to make progress in learning new habits for about 200 runs without electric shock. Miller remarks that it might be thought that the 'mechanism' of reaction had become its own motivation, in conformity with the theory of functional autonomy of Woodworth (1918) and Allport (1937). However, continuation of the experiment shows that among all subjects the reaction becomes progressively slower and then disappears.

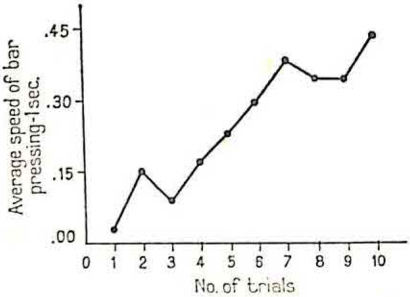

Fig. 17c. Learning a second new habit—bar pressing—as a result of acquired fear.

Conditions were changed so that only pressing the bar would cause the door to open and allow the animals to run from the white compartment where they had been previously shocked into the black one where they had escaped shock. During non-shock trials under these conditions the animals learned a second new habit, pressing the bar. Each point is based on the average speed of 13 animals. (Cf. Fig. 17a, ibid., p. 96.)

B) *Criticism: the problem of acquired drives.* According to the theory of Hull and Miller, the rat acquires new habits for as long as its need to escape lasts which, in this, is an acquired fear. However, if the acquired fear is functionally identical to a primary need, it is not clear why the response extinguishes. Indeed, the fact that the shock is no longer given does not prevent, according to the expressed hypothesis, the production of reinforcement. Once fear has become an acquired drive, this drive decreases with each avoidance response. The response must therefore be expected to continue.

a) This difficulty draws attention to the main weakness of the theory of learning new drives by secondary reinforcement. It seems preferable to regard acquired fear not as a need or drive in itself, but as an emotional reaction to a situation which acts as a signal. The real need, which continues to affect and motivate the subject through the white compartment situation, is the need to escape from the anticipated electric shock when the signal is seen. The white compartment has become, through previous experiments and learning, the signal of electric shock. This interpretation explains the experimental phenomenon of extinction (for interpretation of Miller's theory, see Stevens, 1951, p. 451).

b) Another objection to Miller's interpretation is made by Woodworth and Schlosberg (1954, p. 675). In all experiments of this kind the animal is seen to show no further signs of being frightened once it has learned the way to avoid the danger which threatens it. All its initial emotional responses yield before one line of action which the animal follows calmly and without fear, that is, opening the door and going into the other compartment (see also Warner, 1932). From the behaviourist point of view, fear has thus disappeared; this may be readily understood since no real danger threatens the subject any longer. In fact, it has at its disposal an effective means of escaping the painful stimulus as soon as it appears. It does not even seem necessary to us to invoke a drive for security, as Woodworth and Schlosberg do, to explain why the animal continues to go into the black compartment once its fear has disappeared. It may be admitted that motivation to escape a painful stimulus continues to produce an effect (as long as the animal does not discover that the signal has ceased to indicate danger); but given that it no longer feels either the pain of the stimulus or the menace of a dangerous situation the animal exhibits no further emotional reaction of fear. An interpretation in Tolman's manner, in terms of *signal*, would seem to provide a satisfactory explanation of the facts observed in this experiment.

c) It should be emphasized in connexion with the problem of acquired motivation raised by Miller's experiment, that there is no question here of growth of motivation in the sense of acquiring new drives or needs, but rather a displacement or extension to new objects of already existing wants.

9 Conflict

It happens that the tension created by a drive, a task or an intention does not succeed in producing the type of behaviour which reaches or leads to the goal. Several kinds of obstacle may be encountered. Social prohibition or a physical impediment may prevent the necessary action being carried out; it is also possible that the individual, while exerting all his strength to attain the object, does not succeed and thus finds himself obstructed by his own incompetence or unfitness; lastly, opposition between two incompatible types of action or motivation may drive the individual towards his objective at the same time as driving him away. All these forms of internal and external obstacles which create frustration and conflict have been studied experimentally.

In its widest sense, the word frustration means any interference with obtaining an objective; in the strict sense of the word, it is used in cases where an external obstacle comes between the subject and the object desired. As to conflict, this may be defined from the behaviourist point of view as simultaneous excitation of two competing desires to respond (e.g. approach and avoidance, or two different reactions of approach). From the dynamic or motivational point of view, a conflict situation is one where two more or less equivalent forces of opposing or incompatible aim operate on the subject.

Lewin (1946, p. 809) distinguishes three principal forms of conflict and forces and describes them topographically; Hull (1943) and Miller (1937 and 1944) define them in terms of competition between behavioural response: 1. The conflict of 'approach-approach' reactions where the subject, like Buridan's ass, cannot make up his mind which to choose of two coveted objects; 2. The 'avoidance-avoidance' conflict where the subject wants to avoid both Scylla and Charybdis; 3. The 'avoidance-approach' conflict where the individual is at the same time drawn to and repelled by an object. Most experimental studies concern this last type.

A certain number of studies will be considered here, some of which draw their inspiration from Freudian ideas and others from Pavlovian conditioning and Hull's neo-behaviourist ideas. Some of the latter concern what is called experimental neurosis (see Liddell's summary, 1944). It may also be noted that several authors interpret a large number of dynamic processes in terms of 'defence mechanisms' which aim to avoid or reduce conflict and its attendant anxiety. Experimental studies have been made with several of these, such as repression and projection, but these will not be dealt with in this chapter. They have been studied principally within the framework of the phenomena of memory (forgetting) and *perceptual defence*, etc.

1 Approach and avoidance gradients

Approach-avoidance behaviour has been studied by Hull's school in terms of gradient. The approach gradient was examined systematically from 1934 onwards (Hull, 1934). The studies of his disciples N. Miller (1944, 1951a, 1959), and Brown (1940, 1948) are the most widely known in this field.

A) Brown's experiment, carried out under Miller's direction, gives an excellent example of objective and quantitative research in a field which was for many years limited to clinical experiments. Hungry rats learn to run along a straight passage where they find food at a point indicted by a light. They wear a harness attached to a cord which moves easily so that the animal's movements are not impeded. After they have learnt this, they are restrained for one second at a point either near or far from the goal. While being held back they pull against a calibrated spring attached to a marker tracing on a polygraph. Comparisons can thus be made between the strength of pull exerted in both the positions. The results (see Fig. 18) confirm the authors' *gradient of approach* hypothesis which claims that the drive towards the goal increases in proportion to proximity to it (the difference is statistically significant).

In a second experiment made on another group of animals, the rat is placed at the end of the same passage and given a brief electric shock. After receiving two shocks the animal is again placed in the passage, but without shock; it tends to run away. By means of the technique described, half of the animals are restrained at a point close to that which they avoided and the other half at a point farther away. The strength of pull is again measured at these two points. The results (see dotted line in Fig. 18) confirm the hypothesis of the *gradient of avoidance* according to which the tendency to withdraw from an object of negative incentive value increases in relation to proximity. The comparison of the two results shows a more rapid or intense increase in the tendency to avoidance than in the tendency to approach in terms of proximity (Fig. 18). The authors thus confirm their third hypothesis according to which the avoidance gradient is steeper than the approach gradient. A second experiment in this series confirmed a fourth hypothesis according to which all gradients increase in proportion to the intensity of need. It may be noted, for example, that the dotted line is lower when the intensity of the electric shock is reduced from 13·5 mA to 1 mA (Fig. 18).

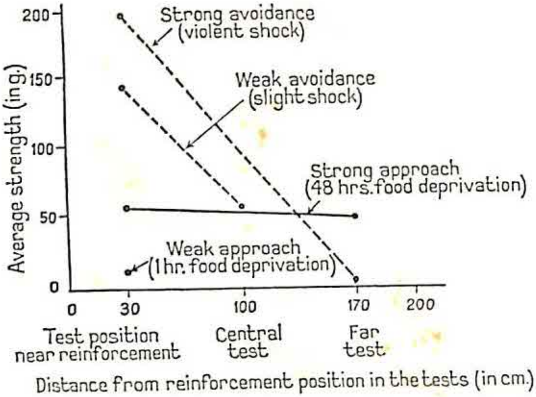

Fig. 18. Effect of strength of drive on gradients of approach and avoidance. The two avoidance gradients represent the strength of pull (dotted lines) on calibrated spring (expressed in grammes), measured at a distance near (30 cm. (12 inches)) and far (100 or 170 cm. (40 or 68 inches)) from the position where the shock was administered. The first gradient (upper line) refers to the trials with strong shock (13·5 mA); the second gradient concerns those with slight shock (1 mA). The approach gradient (solid line) represents the animals' strength of pull after 48 hours of food deprivation. The measurements are made at two points 100 and 170 cm. (40 and 68 inches) away from the food, respectively. Under weak approach conditions (1 hour food deprivation) the animal exercises very slight pull. Strength of pull was measured at 30 cm. (12 inches) from food. (From J. McV. Hunt, *Personality and the behavior disorders*, New York, Ronald Press, 1944 (vol. I), p. 435 (Miller, 1944).)

B) These four basic hypotheses gave rise to a series of experiments on conflict (Miller *et al.*, 1943); the same rats first receive food at a point indicated by a light and then receive an electric shock while eating. The intensity of the shock and of hunger is different for different groups of animals examined. By then placing a hungry animal at the entrance to the passage, it is possible to record its movements without hindering it by using the technique described above. Conclusions drawn from the basic hypotheses are confirmed: the animals approach to a certain point and then stop. The different kinds of hesitation are also studied. Generally, however, it may be said that the point where the animal stops is determined by the relative strength of the two needs; the greater the hunger and the weaker the electric shock, the nearer the animal goes. The conflict between the two responses increases with the strength of the needs. By this method Miller succeeded in confirming experimentally the truth of the Freudian theory which states that very strong evidence of fear and avoidance may be an indication of strong approach tendencies.

Two excellent surveys of the many studies made on this subject within the framework of Hull's behaviourist hypotheses are to be found in Miller's publications of 1944 and 1959. These are a striking illustration of an attempt to reconcile certain Freudian theories on motivational processes with behaviourism, by use of experimental methods. Dollard and Miller (1950) went as far as applying their concept and data to a system of psychotherapy. All this entailed a certain 'liberalization' of the ST theory of Hull's school, without, however, obtaining unanimous support; the authors' support of Freudian concepts inevitably became less wholehearted. These hesitant approach-avoidance reactions are quite natural at intersection points of such antagonistic psychological tendencies.

2 *Flight from conflict*

Another pattern of the forces opposed in the conflict situation is outlined in Masserman and Yum's experiment (1946). They first teach cats to work a somewhat complicated apparatus (Skinner-box type) in order to obtain food. It has been observed that cats do not like milk containing 5 per cent alcohol but prefer plain milk. Hungry cats are placed in a conflict situation by receiving an electric shock when they take the food they have learnt to obtain by working the apparatus. After several painful experiences of this kind, the cats show reactions resembling neurotic conduct each time they are put in the apparatus when hungry (approach and withdrawal movements previously noted in human subjects by Dembo: *vide infra*, p. 62). The animals are then forced to take small doses of alcohol and it is observed that in this state of mild intoxication they no longer show the same fear reaction towards the apparatus but use it as they did previously to procure food (without shock). The important fact is that the cats, through finding relief in intoxication, develop an increasing preference for milk containing alcohol which previously they detested. After manipulating the apparatus several times without punishment, fear and 'neurotic' symptoms disappear and *with fear* disappears also their preference for *milk containing alcohol.* Fear and conflict thus develop a positive motivation for an object which, although detested, saves the animal from a traumatic situation. This attempt to escape from the tension created by conflict is comparable to the 'escape from the field' mechanism referred to by Dembo (*vide infra*, p. 64). It should be noted that R. Watson (1954) interpreted the cats' reaction in this situation in terms of normal behaviour, contrary to Masserman who regards them as neurotic.

3 Social and cognitive conflict

Several other forms of conflict in addition to the three already enumerated have drawn attention, during recent years, to questions of interpersonal relations and conflicts on the cognitive level. Heider (1958, pp. 174–217) formalized several of these types: there is the case where two people each desire the same object (rivals for the love of the same person); or that where two people wish to avoid the same object which at least one of them is obliged to accept (e.g. blame to be accepted by at least one of the two responsible); or that where one of them desires and the other rejects (husband and wife) the same object (a child, for example). A person confronted with the choice of two objects may have chosen one of them and afterwards consider the other object as having much higher incentive value (*post-decision conflict*). There is also conflict arising from the fact that a person likes or admires two individuals who dislike each other or deprecate each other. A group may exercise social pressure on a person's opinions or behaviour. There are also conflicts at the cognitive level where a man is faced with information which conflicts with his own opinions, etc.

Several of these forms of conflict and some others have been studied by experimental methods which, although appropriate, are not all equally rigorous. We can give only a sample of the results here, most of which should, in fact, be treated as tentative.

The tendency to conform to a group was studied by a method developed by Asch (1953, 1955, 1958). All the members of a group except one was informed in advance that they must express opinions contrary to fact in order to see how far the isolated person tends to adapt his opinions to theirs. Asch analysed the motivation underlying this conformity. Crutchfield (1955a, 1955b) showed the relationship between certain traits of character and the likelihood of conformity. These traits are clearly different for men and for women. He also showed that this relation with character is virtually non-existent when the situation is such that conformity to the group is extremely important to the subject.

Another form of social pressure is a persuasive argument which induces someone to take a decision (choose an object, for example) which satisfies neither his desires nor his real needs. An internal conflict ensues. In an impressive series of researches on persuasion made under Hovland's supervision (see Janis, 1959; Hovland, Janis and Kelly, 1953; Janis, Hovland *et al.*, 1959; Milton *et al.*, 1961) several of the processes in which the individual reacts to this post-decision conflict situation were studied. Amongst other things it is observed that the subject uses his cognitive processes to justify and uphold the decision taken and avoids or is unaware of any information which reopens the matter. It may also happen that a subject, who acquires some interesting information from a source he disapproves of, at first acts as if he were unaware of it, only to divulge it several days later without remembering its source (*sleeper-effect*).

Festinger (1959, pp. 389–90) studies the tendency to change opinions in order to lessen conflict about one's own behaviour. He submits subjects to a highly tedious experiment devoid of interest; he pays them to tell others that the experiment is very interesting and agreeable. Results show that the subjects change their minds later and believe what they had told the others. It is especially interesting to note that this tendency becomes less pronounced when the payment is higher. Festinger believes that in this case the money received is sufficient to justify in the eyes of the subject the 'dissonance' between his opinion and his verbal behaviour. Brehm (1956) also observed that after a difficult choice between two objects of almost equal incentive value, the object chosen tends to become more attractive, whereas the rejected object acquires a less positive value than it had at the beginning (see also Brehm and Festinger, 1957). It will be noted, however, that, according to common observation, an object often loses its attraction once acquired, whereas a rejected object appears more attractive.

Festinger (1957) accumulated a certain amount of data in favour of the theory that the 'cognitive dissonance', that is, the disagreement between two or more cognitive concepts (opinions on environment, on others or on oneself) is a motivation *sui generis*. In order to reduce the tension caused by this cognitive conflict, subjects tend to accept information and rumours justifying their own opinions and are able to ignore or avoid others. In a group experiment, he also studied the process used by members of a religious sect to preserve their belief in certain opinions which were clearly contradicted by facts (Festinger *et al.*, 1956). The mechanism is the tendency towards internal consistence which apparently exists in the individual human being; this internal consistence may be considered a way of avoiding situations of mental conflict. Many different processes are set in motion by the tendency to avoid conflict or to reduce the tension which it produces.

10 Obstacle and frustration

The problem of frustration must be studied in direct relation to what has just been said about conflict and in conjunction with the following paragraph on how the mechanisms involved in frustrated desires function. The countless studies in this field were principally inspired by two schools of thought, Lewin's and that of the University of Yale. The work of Dembo, a disciple of Lewin's, is fundamental in the analysis of a certain number of important ideas.

1 Internal and external barriers

A) *Impossible tasks.* Dembo (1931) gave university students tasks which, without appearing to be, were in fact unable to be fulfilled.

In the first experiment the subject is placed 12 feet away from a table on which there were two bottles. He is given ten wooden rings 6 inches in diameter and is told to practise until he can throw ten rings one after the other on to the neck of one of the bottles. The experimenter had previously noted it was practically impossible to carry out this task in those conditions. In the second experiment the subject is placed in a square (8 × 8 feet) made of slats of wood placed on the laboratory floor. Inside the square is a chair and a 3-foot 6-inch easel is placed 4 feet away from the enclosure. He is told to remove a flower from the easel with one hand without his feet leaving the enclosure. The subject soon finds a way of doing this (kneeling with his feet inside). The experimenter then tells him to find another method. Often the subject finds a second way of carrying out the task by putting the chair between the flower and the square and leaning on it to reach the flower without his feet leaving the square. Encouraged by this, the subject is then asked to work out a third method—which does not exist, even though the experimenter continues to assert that it does. This creates another kind of impossible task for the subject. Dembo encourages the subject and, if necessary, puts sufficient pressure on him to make him go on trying for an hour or two or even more. Sometimes the experiment is repeated two or three days running. This situation, which gradually becomes very strained and intolerable for the subject, allows the investigator to study the processes involved in becoming angry. This anger may become so strong that it provokes violent reactions against certain objects and even against the experimenter.

B) *New ideas.* Dembo's work introduced for the first time several ideas which have since been the subject of countless experiments. Among these new ideas are the concept of the level of aspiration[1] in its relationship to failure and success, substitution (*Ersatz*), the degrees of reality and unreality of actions, as well as Lewin's celebrated topological diagrams representing the structure of the personality and social relations. As for the obstacles themselves, Dembo describes the situation and the subject's reactions in terms of conflict between two kinds of barriers: there are, first, internal barriers which prevent the goal being reached. These may be material objects, the difficulty of the task itself or the subject's adequacy. The external barriers, according to Dembo, are those which prevent the subject from reducing tension by 'leaving the field', that is, by abandoning the task; *in casu* this refers to the social relations between the experimenter and the subject, as well as the fact that the latter has accepted the task; he owes it to himself to carry it out. The conflict created here by Dembo is the inescapable situation for a man who, through previous unsuccessful attempts, feels his incapacity to satisfy the exigences of the task and of his social commitment. The author describes how the behaviour of the subject shows a to-and-fro movement of approach and avoidance towards the barrier inside the field, which reveals the ambivalent nature of the obstacle and produces neurotic-type reactions (see certain experiments on experimental neurosis, pp. 58–59). In this increasingly painful situation it was possible to study several characteristic processes: firstly, the passing to a plane of unreality, that is to say the subject withdraws himself by means of his cognitive and symbolic processes from the true situation and constructs imaginary situations. On this level, internal and external barriers become less rigid and therefore more penetrable for the subject. Figures 19 and 20 give an example of these topographical schemas often used by Lewin. Above the real plane where the subject is bound within a field of action and separated

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[1] Dembo's work precedes that of Hoppe (*vide supra*, p. 21) although it was published a year later.

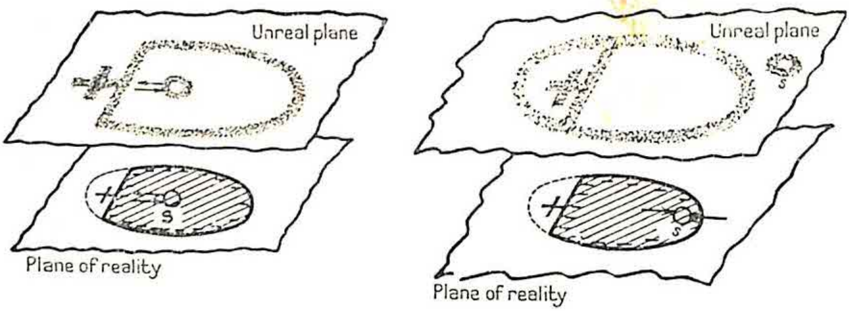

Fig. 19 and 20. Topographical diagrams of Lewin's school.

Above the plane of reality with its insurmountable barriers (solid lines), the subject transfers the situation in his imagination to the unreal plane where the field and the barriers become penetrable (dotted lines) and allow approach or flight beyond the field. (From T. Dembo, *Der Aerger als dynamisches Problem*, *Psychol. Forschung*, 1931, **15**; see p. 38 for Fig. 19 and p. 66 for Fig. 20.)

from his objective (cross) by an unbroken line, an imaginative level is progressively constructed whose barriers are more permeable (dotted line). The subject may indeed remain within the field of action but imagine the way to the goal to be less obstructed (cf. the unreal plane of Fig. 19 with the subject inside the oval); it may also happen—and this is another very significant process—that he 'leaves the field' (cf. the unreal plane of Fig. 20 with the subject outside the field). For example, the subject starts to read a newspaper after having tried to persuade the experimenter to end the test. Having left the field, the subject is not, however, entirely detached from his task; his behaviour reveals a certain link with the field: he does not move about freely and he awaits new instructions.

Another essential process described by Dembo is the destructuring of the field. The structures within the field and those of the personality lose their form; not only do obstacles or barriers acquire a negative value, but the whole field, including the experimenter, becomes a hostile world although, sometimes, the subject may begin to confide in the experimenter (disintegration of mental organization).

2 *Frustration and aggression*

Another principal study of frustration, defined as any kind of interference in obtaining an objective, is that of the 'Yale group', under Dollard's direction (1939). Together with the studies made by Lewin's school, this work marks an important stage in the attempt of contemporary psychology to formulate certain phenomena of human behaviour observed clinically and socially in terms of experimentally verifiable hypotheses.

A) *Basic hypothesis.* The hypothesis elaborated by this group states that *all* frustration creates an internal 'instigator' or motive for aggressive action. Aggression itself is conceived as an act which may take several forms but whose object is to harm an individual or anything which may be identified with him. The hypothesis admits that instigation to aggression produced by frustration is not always sufficient to provoke manifestly aggressive behaviour and that alternative responses are possible (substitution, for example). It was chiefly through investigations of cultural anthropology that this theory was first expounded by the

Yale group; they were particularly concerned to explain several cultural phenomena; for example, the black-white relationship in the southern states of the United States of America. Since then a large number of experimental studies have been carried out with the aim of testing the 'frustration-aggression' hypothesis. A survey of this literature was made by Berkowitz (1958). Mention will be made here only of some studies which provided specific information or brought to light new variables.

B) *Subsidiary variables.* French (1944) uses the technique of insoluble problems to produce frustration and adds elements provoking fear (smoke in a closed room). His results show that in fact frustration *often* provokes aggressiveness. In conformity with the Yale hypothesis, this aggressive behaviour also produces a certain cathartic effect. However, French shows that Lewin's topological system gives a more plausible explanation of certain experimental observations, particularly the fact that aggression is produced more easily when it is itself either a means to the goal from which the subject has been barred or a means of escaping from an object of negative incentive value.

Furthermore, it has proved partially possible to quantify the relationship between frustration and aggression. Sears (1940), Barker, Dembo and Lewin (1941) observed that aggressive behaviour became increasingly violent according to the intensity of the frustrated desire. Instigation to aggressive action also increases according to the proximity of the object at the moment of frustration (Haner and Brown, 1955). Block and Martin (1955) repeated Barker *et. al.*'s experiment (1941) in most favourable experimental conditions; they also confirmed the increase in aggression in relation to the intensity of frustration.

Pastore (1952) added an important variable; using a technique derived from the work of Doob and Sears (1939), he showed that aggressive reactions are more numerous when the frustrating situation stems from another person's act which is seen as arbitrary rather than reasonable (see also details added by Cohn, 1955).

C) *Punishment and aggression.* The influence of punishment on manifest aggression was studied by among others, Chasdi and Lawrence (1951), with 50 pre-school children in doll-play. It was observed that children whose aggressive acts were severely punished at home tend to be more aggressive in play than children who receive less punishment at home. However, children whose aggressive acts towards the dolls are punished during the experiment are noticeably less aggressive than children who are not punished during the experiment. A study published the same year by Sears (1951) shows an increase of aggression on the level of imaginary activity as a result of punishment of aggression in real life (see also Maslow *et al.*, 1941; Feshbach *et al.*, 1957, also studies mentioned on p. 75).

D) Developmental studies of aggressive behaviour originating in the conditions of early childhood has been the subject of many useful studies (see for example Lois Murphy, 1956). Constitutional factors also have been shown to influence aggressive impulses (*vide inter al.* the excellent studies by Valentini, 1951, and 1957 on aggression in male pigeons).

The *degree of tolerance* of frustration was examined in relation to psychological and physiological factors (Thiesen and Meister, 1949). This tolerance seems to be rather specific (see also Rosenzweig, 1944).

3 *Frustration and regression*

A) Another effect of frustration is regression of behaviour in that there is a return to less developed forms of behaviour (*primitivization*). This concept of regression need not imply that mental development passes through a series of libidinous stages. Barker, Dembo and Lewin's experiment (1941) is highly relevant here (the first chapter, which is theoretical and precedes the description of the experiment, was written by Lewin and has been translated into French: see Lewis, 1959, pp. 92–135). The authors first established a scale showing the development of the child in play, expressed in monthly units. It is generally recognized that play becomes better organized and structured with age, showing more varied, differentiated and detailed elements of action and more complicated fantasies. In the experiment 30 intelligent pre-school children were put into three different play situations. The children are divided into three age groups, the first consisting of ten children of 2–3 years with an average IQ of 114·8 (Kuhlmann-Binet); the second group comprises 12 children of 3–4 years with average IQ of 125·3; and the third group eight children of 4–5 years, average IQ 125·6 (Stanford-

Binet). Each child is allowed to play freely alone for 30 minutes with toys placed at his disposal in a room divided by a partition. The following day he has access to the other half of the room, the partition having been raised, and can play for 15 minutes with other toys which are more attractive than those of the first day. Then without explanation the experimenter interrupts the play and brings the child back to the first half of the room where he is allowed to go on playing for 30 minutes with the less attractive toys. The screen separating the two parts of the room is now a transparent blind which, when lowered, allows the child to see the attractive toys he can no longer reach.

B) *Results.* The quality of play, that is, its level of organization, was measured the first day by means of the scale mentioned above. It was measured again for the frustration period (the 30 minutes' play in the last stage with the first day's toys). It is thus possible to calculate the difference in the developmental level of the play expressed in monthly units by comparing the two results obtained for each child. The quality of play shows regression or 'primitivization' expressed in less-well-constructed and differentiated activity: restricted activity and interest, clumsy manipulation and a decreased amount of realism and awareness of perspective (see Fig. 21). Also, more regression is observed among children showing greater signs of frustration. The ten children who appeared to be least frustrated by being interrupted during their play with the attractive toys also showed less aggression than the others.

C) In addition many other motivational and effective factors seem to have an effect on regression. Psycho-analysis deals with them in relation to fixation. On the experimental level, Dembo (1941), in the experiment described above, observed regression following emotional tension, and Lois Murphy (1937) observed the same thing following insecurity. Lewin (1935, pp. 95–6), however, showed that occupations became unstable as a result of frustration. For instance, he observed that a child of three who is prevented from continuing with his favourite occupation (drawing) takes up other activities but devotes an average of only 3·5 minutes to each, whereas on the previous and the following days (with no frustration) he devotes an average of 14·6 minutes. This is an observation of considerable interest in the explanation of unstable conduct.

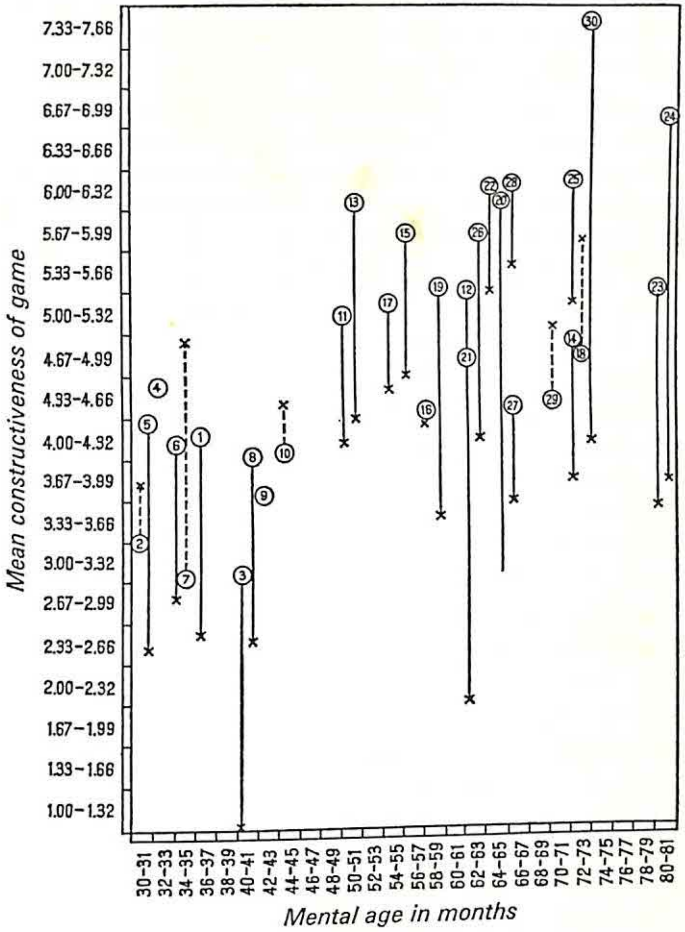

Fig. 21. Constructive character of children's games in relation to mental age and change in this constructive character in a frustration situation.

The degree of constructiveness of each child's play in a frustration-free situation is shown by a circle, and its identification number is given. The degree of constructiveness of play in a frustrating situation is shown by a cross for each of these same children. The extent of the different degrees of constructiveness in the two situations (with and without frustration) is indicated by the length of the line which links the circle to the cross in each case. The line is solid when the degree of constructiveness decreases with frustration, and dotted when it increases. Where no cross is shown opposite a circle the degree of constructiveness is equal in both situations. (From R. Barker, T. Dembo, K. Lewin, *Frustration and regression. Studies in Topological and Vector Psychology*, Vol. II, University of Iowa Studies in Child Welfare, No. 18, p. 124.)

11 Redirection of persistent tension

Inability to reach a desired goal or being impeded in one's attempts do not always end in frustration. Another object or action may take the place of the original goal. Such cases are referred to as displacement or substitution (*Ersatz*), a process which may be understood as a means of reducing tension by finding a replacement. Freud cited several methods of this type to explain the escape mechanisms created by the repression or blocking of instinctive needs. His view of the psyche in terms of energy and his theory of the convertibility of this energy facilitated this kind of explanation. The process of sublimation and displacement, as well as the occurrence of neurotic symptoms and dreams, must be regarded as part of a transformation by substitution.

1 The persistence of tension

Before studying the means by which unrelieved tension is reduced the experimental evidence for the existence of such a state of unsatisfied need must first be examined. This seems fairly clear with physiological or homoeostatic needs, but the credit for demonstrating that an instruction, an intention or a task creates tensions must be given to Lewin's school (Lewin, 1951, pp. 1–29); these 'quasi-needs' as he calls them (1926) may be distinguished from more general and permanent needs—such as the need to hold a position in society—by their very specific origin and character. The first aim of this long series of experiments (*vide supra*, p. 13A) was to prove that 'quasi-needs' actually possess the essential qualities of real needs, namely, those of producing tension leading to action and persisting until the objective is reached or another object or action is substituted.

A) *Method.* The technique introduced by Lewin for creating and maintaining the state of tension consists of *interrupting* the subject's activity during the proposed task. The classic experiments in this field are Zeigarnik's (1927) and Ovsiankina's (1928). Zeigarnik's work, which is mainly concerned with the mnemonic effects of tension, is dealt with elsewhere (cf. chapter on memory); Ovsiankina's study is directly related to the present chapter and will be dealt with here in detail. Ovsiankina (1928), using 124 subjects (108 adults and 16 children of 3–16 years), gives them a series of tasks to perform, certain of which have a well-defined 'contour' (*Endhandlungen:* e.g. assembling different pieces of a puzzle); others are series of operations without a defined limit (*fortlaufende Handlungen:* for example, threading beads on a very long thread). During two one-hour periods, 8 to 12 tasks are set. The majority of these (six to eight) are interrupted at different stages of execution. This interruption occurs either in an apparently casual way (someone comes to fetch the experimenter) or by the experimenter giving a new task to the subject. In certain cases the experimenter forbids the subject to continue the interrupted action; in most cases he says nothing to him.

B) *Results.* Ovsiankina observes that after a casual interruption, 100 per cent of the activities are spontaneously resumed: after interruption due to a new task being allocated, the work is resumed in 74 per cent of cases. Certain subjects admit during the interview which follows that they felt a desire to resume and complete the task but did not do so for a variety of reasons (taking these latter cases into account, the resumption figure is 83 per cent). The spontaneous resumption of the interrupted task usually follows the interposed activity (during the first 0 to 4 seconds). In cases where the subject no longer has the material for the interrupted task, he may feel that there is something he should do without remembering exactly what it is. The subject does not resume the work because he thinks that the experimenter wants him to finish the task, since resumption often occurs during his absence and even when specifically forbidden; it is considered a personal need. The motivation here is not produced by the sight of unfinished work; in fact, the experimenter observes that the subject does not tend to complete anyone else's unfinished task. Activities having a well-defined 'contour' are more frequently resumed than less defined tasks (in the bead-threading test, for example, only 46 per cent resume the task when instructions are given in general terms and the number of beads very great; 70 per cent resume the task when instructions are more precise, e.g. they are given 30 beads and told to thread them all). Resumption is most frequent with activities interrupted at the beginning and just before the end; even a task interrupted immediately after instruction is often resumed. It frequently happens that the subject is opposed to interruption of the work and wants to finish it first. All this leads one to conclude that a personal system of tension is created by the task in the direction indicated by the instructions. Ovsiankina's experiment also supplied details of the frequency of resumption in terms of certain traits of personality (ambition, for example) and of inhibition through fear of failure, topics which have been the subject of numerous studies since then (*vide supra*, p. 20).

2 *Substitution* (*Ersatz*)

The most advanced research on substitution is that of Lewin's school (1935, pp. 180–93) carried out by Lissner (1933), Mahler (1933), Köpke (see Lewin, 1935, pp. 211–13 and 271–3) and Sliosberg (1934). One wonders whether the presence of tension created by a task (Ovsiankina, 1928) can be dissipated, at least partially, by substitute activity and, if so, in what conditions. The system of tension is produced by the standard technique of task interruption. The activity which follows this interruption is said to have a substitution value in so far as the tendency to resume or continue with the interrupted task disappears after the interposed activity. Non-resumption indicates, in fact, that the tension has been dissipated (Ovsiankina, 1928) and so we can truly say that this activity performs a substitutive function.

TABLE II

Average percentages of resumption of interrupted tasks

After substitution activities				*With no substitution*
Easy (*N* 30)		*Difficult* (*N* 30)		
Dissimilar	*Similar*	*Dissimilar*	*Similar*	
80	50	62	33	87

A) *Lissner* (1933), after interrupting the subject's initial task, gives him a new task to perform, chosen in such a way that different characteristics determining its value as a substitute can be assessed (easy and difficult tasks, similar or dissimilar compared with the first task, etc.). Table II shows a typical sample of the results obtained. A difficult activity (longer performance time) has a greater substitution value than an easy one. Where they are of equal difficulty, the substitution value is greater when the second task resembles the first one (e.g. assembling a mosaic of a man, then of a cross).

B) *Mahler* (1933) studies the value of substitution activities at different 'reality' levels. If, for example, the subject has to build a house with toy bricks, the task could be interrupted and the subject required to finish the construction by *drawing* the remaining part, or *explaining* how he intended to continue; he could even be asked simply to *reflect* on the way he meant to finish the construction without actually revealing his plan. These three ways (drawing or doing, speaking and thinking) are considered as three 'reality' levels of behaviour. This is the same technique as is used by Lissner (1933) except that instead of interposing a *new* task after interrupting the first, Mahler arranges for the substitute activity to be a completion of the original task but on the *Ersatz* level. A brief pause after it is completed on this level allows him to see if the subject shows a tendency to resume the activity and complete it on the level of actual action. Table III shows that verbal activity has an inferior substitute value to that of motor action (drawing). In the building-brick experiment (*Mosaïkaufgabe*), the verbal solution is followed by resumption of the task in 75 per cent of cases (N = 17), whereas the purely intellectual solution (N = 28) is followed by 86 per cent resumption. . . .[1] In

TABLE III

Percentages of resumption of an activity after completion by active substitution and verbal substitution
(After Mahler, p. 44, Tab. 4)

Unfinished activities (N 66)	*Completion by active substitution (N 71)*	*Unfinished activities (N 35)*	*Completion by verbal substitution (N 36)*
65	29	67	42
Ratio: 2·2		Ratio: 1·6	

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[1] It should be added that statistical calculation of results in these interesting experiments is almost non-existent. The qualitative and purely psychological analysis of behaviour constitutes the remarkable contribution made by these experiments of Lewin's school.

another test (arithmetical operations) the difference between the two levels of reality is 17 to 100 per cent.

C) *Substitution and intrinsic objective.* The substitution value of an activity depends principally on how closely it comes to reaching the goal of the original task. Mahler analyzed two experiments in which the initial task consists in numbering a series of objects: the subject is first required to number pages and then to write a number next to each of a number of crosses drawn on a large sheet of paper. After interruption, the subject is asked to continue verbally on both tasks. The substitution value of the verbal action is considerable in numbering the crosses (8 per cent only resume work in a group of adults and children), but very small in numbering the pages (85·5 per cent resumption). Analysis shows that the motor action of numbering has a different significance in the two tasks. As far as the pages of the book are concerned the subject believes the real purpose of his task is to mark the numbers of the pages, which involves writing on each one, whereas with the crosses, the essential task is to *count* how many there are. Thus the continuation of the task on a verbal level attains the original purpose in the latter case, but not in the former. It is important to observe that experimentally the substitution value of an act depends essentially on whether or not it attains the original purpose of the initial activity. The average percentage of resumption of initial activity in a series of experiments on this subject is 75 per cent when the object of the initial task is not reached by the act of substitution compared with 13 per cent when the essential objective is considered more or less reached. In these experiments, the control tasks (with interruption but without substitution) were resumed in 75 per cent of cases for the first series and 60 per cent for the second (ratio of 75 : 75 = 1, 60 : 13 = 4·6 with the experimental group).

3 *Displacement and generalization*

An analogous process to that of substitution is displacement, which has been studied experimentally in relation to the well-known processes of stimulus and response generalization. The sheep conditioned to withdraw its right hoof when a light signal goes on reacts by removing its hind hoof when its front hooves are tied down (Liddell, 1944). Also the greater the need, the less the object releasing the consummatory response needs to be specific. Thus a starving man might chew wood and some animals in heat attempt sexual behaviour towards inappropriate objects. These processes of generalization and displacement are well known in clinical psychology where play therapy, for example, reveals that a boy who is very aggressive with his play-fellows originally felt aggression towards his father, but could not give vent to it. Miller's 1948 experiment provides an example. Two rats conditioned to fight each other as soon as an electric current is passed through the floor grating of their cage attack a similar object (a sort of model) when one of them finds itself alone in the cage at the moment the shock is transmitted.

4 Displacement and social aggression

A form of displacement of aggression analogous to that following frustration was observed by Miller and Bugelski (1948) in the realm of attitudes about certain social groups. A higher number of unfavourable traits was attributed by American recruits to Japanese and Mexicans after a frustration situation imposed by military authorities. However, this phenomenon was not confirmed by later experiments (Weiss and Fine, 1946; Stagner and Congdon, 1955).

Several authors have interpreted discrimination and tension between social groups as being related to displacement of aggression resulting from frustration or repression (Adorno *et al.*, 1950; Berkowitz, 1959). Also, delinquency has been studied in relation to aggression, extrapunitive responses and frustration. Rosenzweig's *Picture-Frustration Test* (1952) is one well-known research method in this field, as well as the technique used by Doob and Sears (1939) where the authors require subjects to express their probable reactions in frustrating situations. Within the framework of Freudian personality theory and using the scales method, Farber (1955) found a significant correlation ($r = 0{\cdot}37$) between the results of 130 students on a scale of anal characteristics and another measuring aggressive political attitudes.

5 *Equivalence of needs*

How far is the true transfer of one need to another possible? Stated in terms of excitation, the problem may be put in this way: to what degree do the patterns of excitation of different instincts resemble or overlap each other? For example, up to what point can a state of thirst set in motion feeding behaviour in the absence of the appropriate object (water)? N. Miller's experiment (1948) allows one to conclude that hunger and thirst have a certain degree of functional equivalence which may be expressed equally well by the concept of generalization or by displacement. There are more complicated cases where the emotional needs require one to take large quantities of sweets or all kinds of food in order to reduce the tension (Bruch, 1940). As for the process of displacement and substitution in the form of sublimation, this has given rise to very little experimental research and the few studies on it do not confirm the hypothesis of sublimation. Phillips *et al.* (1953) tried to study a reaction formation experimentally.

12 The mechanism of motivation

Ever since psychology abandoned to a large degree the concept of association as the dynamic pattern of behaviour, concepts of need and tension have emerged. Several schemas have been proposed to explain why the individual reacts towards a desired goal in the way he does. The most widely accepted view at present is that of need reduction. This differs very little from the hedonist theory of Thorndike (1932) or Troland (1928, 1930; see also Beebe-Center, 1932; Young, 1936, pp. 318–87). The essential difference is that the hedonic process is formulated in subjective terms of satisfaction or pleasure, whereas behaviourist psychology prefers the objective schema of 'consummatory response' and reduction of physiological needs. This puts the emphasis on the cessation of pain rather than the positive search for pleasure (*vide supra*, p. 49). The Freudian 'metapsychology' which may be considered as the prototype of this schema uses the pleasure-pain principle based on subjective experience in addition to the objective and physicalist formula of discharge of energy. Lewin's system (1938) also adopted the schema of the reduction of tension by emphasizing the system of tension created by what he called the quasi-needs (*vide supra*, p. 70).

There are two important variants in the motivational schema we are considering which arise from different views about the element of direction or selectivity characterizing motivated behaviour. In the opinion of Woodworth (1918, 1958), McDougall (1908), Holt (1915), Tolman (1932, 1949), Allport (1937), Murray (1938), Moore (1948) and almost all European psychologists, motivated behaviour is essentially directed towards an objective; for Hull and most of his disciples, particularly Brown (1953, 1961) and Bindra (1959), this direction results from learning. Less important variants are based on different views of the process by which the state of tension or need sets the organism's motor system in motion. Freud and Lorenz, for example, regard energy as being transmitted by afferent pathways and discharged by the effectors. On the other hand, Lewin (1938, see also Heider, 1960) proposed a more flexible schema within his topological and hodological framework. Also certain neurophysiological studies have shed light on this process which cannot be gone into here (for the physiological basis of motivation, see the excellent work by Dell and Lairy, 1959). Let us rather try to establish the position from a motor point of view starting with the mechanism which connects the motivational state or need with motor behaviour; then the problem of the direction of motivated behaviour and its relationship to learning; and finally the need-reduction mover.

1 Motor discharge and homoeostatic equilibrium

Attention has already been drawn to the idea of *stimulus* as a starting point for action in behaviourist and neo-behaviourist psychology (*vide supra*, pp. 1–3). Freudian-based psychology holds a similar view in so far as the stimulus—which in this context means internal stimulation arising from physiological need—is supposed to increase energy thus destroying the balance of the 'psychical system'. Thus the *stimulus-drive* produces a discharge of energy which constitutes behaviour (Freud, 1895, 1900, Chapter 7; 1911, 1920). The homoeostatic schema inspired by Claude Bernard's studies on the internal environment and those of Cannon (1932) on homoeostasis as well as the energy-based concepts of ethologists (Lorenz, 1937) imply an analogous mechanism of need-reduction as a fundamental process of motivation. Furthermore, according to Hull, this mechanism constitutes the fundamental law of learning. So the concepts of homoeostasic discharge of energy through needs and avoidance of stimulation are closely related in the contemporary study of the mechanism of motivation.

Certain experimental evidence throws doubt on the old model of the discharge of energy through the effectors. Kohn (1951) observes that hungry rats who have learnt to obtain food by pressing a lever when hungry may cease to do so without any discharge of energy being produced via the effector organs. Instead of feeding them, Kohn injects a nutritive solution directly into their stomachs. The rats stop pressing on the lever and show no further signs of hunger, although the energy which was supposed to have been accumulated as a result of hunger was not discharged in feeding behaviour. According to the old theory, search for food would cease only when the accumulated energy had been 'drained off' via the effectors.

Other data suggest that not even the re-establishment of the homoeostatic balance stops the activity set in motion by the need. Indeed, during Kohn's experiment (1951) the rats cease to search for food even before the nutritive injections can have produced any change in the biochemical state of the organism. On the other hand, Bellows (1939) showed that a thirsty dog stops drinking after swallowing a certain quantity of water, even if this water does not reach the stomach but is siphoned off by a fistula introduced into the œsophagus. The quantity of water which the dog drinks under these conditions is the same as it does normally. It seems, therefore, that stimulating certain receptors is sufficient to stop the behaviour produced by thirst. It is known that these receptors are localized in the mouth and the oesophagus for thirst, and principally in the stomach for hunger. It might then be thought that stimulating these receptors would be sufficient to satisfy the needs in question temporarily and on the behavioural level. These data and interpretations are confirmed by Miller and Kessen's experiments (1952) and those of Berkun, Kessen and Miller (1952). However, it seems likely that cessation of the act of drinking also depends on conditioning which evokes expectation or anticipation of satiety following stimulation of a given duration. On this level of motivational mechanism it is important to observe the probable effect of anticipatory behaviour.

2 Direction, learning and 'cues'

As we have seen on pp. 1–3, some psychologists regard motivation as a system of tendering the organism sensitive to certain external stimuli. These external stimuli produce responses which develop either according to an instinctive or innate pattern (ethologists) or through a network of connexions progressively established in accordance with the laws of learning. Here the principal problem of the direction of behaviour presents itself. Psychologists who see motivation as a sensitizing agent usually refuse to attribute a purposive role to it. Motivation provides the energy for behaviour but does not direct it. Direction is due to signs given by external stimuli (*cues*) and particularly to learning. Learning is responsible for the fact that responses take a particular direction, that is, that a certain well-defined response follows a certain stimulus.

A) Solid facts at the root of this concept are these: In the newborn child and in higher animals, hunger as such does not produce food-seeking behaviour. It produces various reactions (babies' screams and a general increase in activity) but it is through learning that behaviour becomes progressively oriented towards the desired object. One cannot therefore define hunger as a tendency to eat (*drive for food*). As to the instinctive manner in which certain animals seek food, one could argue that innate connexions replace acquired connexions, but this does not have any direct bearing on our view of motivation as such. It should be noted that ethologists, like Lorenz and Tinbergen, distinguish the idea of *Stimmung* (indicating the dynamic factor) from that of the directional determinant, both of which are to be found in the environment. Lewin (1938) also attributed an orienting function to objects and valences in the outside world, although his position on this question is confused and inconsistent in his various writings.

B) Disagreement on this question seems to be due largely to there being two different concepts of what *direction* of motivation means. Those authors who see it as the result of learning regard it as a well-defined path leading the individual to a definite object. It is obvious that in non-instinctive behaviour learning influences the actual direction of behaviour. However, the reason why the organism selects certain objects and learns how to attain them has yet to be explained. These authors claim that certain objects act as innate reinforcers while others do not (*vide* e.g. Bindra, 1959). That is exactly what supporters of *purposive* behaviour mean by inherent direction of motivation, namely that motivation produces action which require contact with a *specific* sort of object and only certain objects act as reinforcers (the individual returns to these same objects). Moreover, the motivational factor is such that it ceases to operate only when an object or a result of a more or less defined category is attained. That is what we mean by the objective direction of motivation. In the last analysis it is impossible to attribute this orientation to learning, since reinforcement of associations implies and presupposes precisely this selectivity towards certain objects.

The fact that motivation does not necessarily guide the subject to the appropriate object by the most direct way does not constitute an objection. On the contrary, the fact that one must *find a way*, and that only the way leading to a particular object is learned, shows that it involves special objects and therefore inherent orientation or direction.

C) This view does not in any way lessen the importance of the directive function which the Hullions and ethologists attribute to environmental signs or *cues*, but it should be emphasized that in the last analysis these external stimuli derive this power from the directing and selective pressure exerted by motivation itself. This concept is confirmed by experiments described by ethologists as well as those by leading theorists. Lorenz and Tinbergen (1938), for example, describe the reaction of a species of goose when an egg rolls out of the nest. The goose stretches its neck, places its beak behind the egg and pushes it towards the nest. This reaction is aimed and adapted constantly in such a way that the goose controls the egg's tendency to roll to the side. The reaction is, therefore, directed by external stimuli determined by the egg's position. In addition to this purposiveness in the sense of constant adjustment—due here to an instinctive mechanism and in other cases to learning—there is the fact that the goose behaves in such a way that there is a general direction of *movement towards the nest.* This general direction of movement is so independent of external stimuli that it remains the same even when the egg is removed before the goose's very eyes. One may infer that the dynamic determinant is such that it controls an activity directed towards a 'return to the nest'. The environmental stimuli provide the basis for progressive adjustment of an intrinsically motivated act.

D) Acquired reactions cannot be explained solely in terms of learning since out of several possible reactions only one becomes *activated* as an orienting motivation. This was proved by work by Külpe's school on determining tendencies (*vide supra*, pp. 5–6) and was shown by Leeper (1935) in an experiment which has become a classic. The American taught rats two paths—one to water, the other to solid food. It will be appreciated that these two motivations—hunger and thirst—elicit differently directed actions both of which are part of the animal's repertoire: hunger directs the rat along the path leading to food, and thirst along that leading to water.

To sum up, when at the outset the organism does not have an innate pattern of directed and adaptive behaviour, it is able to make use of environmental cues to learn how to achieve the end to which it is intrinsically oriented. When several conflicting reactions are possible, the state of motivation determines which one will be selected. Piéron (1935) states that 'it is the motive which is dominant at the time that determines which, of all the habits available, is selected'.

It should be noted that this element of direction inherent in motivation is important also in studying the *development* of motives. What identifies and unifies the existence of a particular need throughout the multiple forms its development takes is its purposiveness towards a certain type of situation (Nuttin, 1959, pp. 120–5). Moreover, this unifying orientation underlies another essential function of motivation which can be mentioned only briefly here: it is the motivational determinant which *organizes* the many individual responses into a unified system of behaviour (organizing role of motivation).

3 Reducing tension

The schema of reduction implies by definition that behaviour tends to diminish tension and not to increase it. However, there are many cases where an individual clearly seeks to increase tension. It might be thought that the individual desires this as an anticipation of the pleasure of discharge later. Apart from many instances of everyday and systemation observation which throw doubt on this line of thought (see Freud, 1924; Goldstein, 1940, pp. 140–2; Maslow, 1954; Asch, 1952; Nuttin, 1955 and 1956), Sheffield, Wulff and Backer's experiment (1951) sheds an interesting light on this problem.

A) It is observed that many organisms, in certain circumstances and in various ways, seek an increase in sexual excitement. According to the above theory, this increase of tension is sought because of the detumescence or final discharge. Sheffield used for his experiment young male rats with no previous sexual experience. One peculiarity of sexual behaviour in the rat is that the male mounts the female a dozen times in brief copulatory acts before ejaculation. These preliminary acts increase the state of tension. The experiments place the male rat at the entrance to a passage. At the other end is a cage into which the female is placed after the male enters the passage. After two preliminary copulatory acts, the female is removed and the male consequently never reaches the stage of need-reduction. In these conditions two facts are observed:

1. When the rat is once more placed at the entrance to the passage, the time required to reach the cage at the end decreases progressively and a normal learning curve is obtained;
2. There is no indication that the response is extinguished after 28 trials. It is impossible to explain these two phenomena in terms of secondary reinforcement, in view of the previous absence of complete copulation. It must therefore be concluded that increase in tension constitutes in itself the reward and the goal of this motivated conduct. There is no doubt that anticipated possibility of a reduction of tension or the realization of an ambition often plays an important role in man, but this does not change the fact that stimulating contact and even tension are sought for and seem to provide intense satisfaction.

B) There is an often overlooked aspect of the motivational process which should be considered, and that is that man *seeks to upset balance* as soon as he reaches one goal and sets out on new projects to follow increasingly difficult paths. He assumes new responsibilities and will not tolerate a situation where he cannot give himself something important to do, as has already been seen (Nuttin, 1959, pp. 138–9, and 1961). Man is unhappy and may become neurotic when he has nothing more 'to do', no project to carry out, and when no one expects anything of him. This lack of something 'to do' is at the root of the neurotic's complaint that life has no meaning. This constructive aspect of human motivation must be considered in our schema. It is agreed that balance should not be considered as absence of tension (Freud, 1895), but as a state of greatest interaction with the environment; however, this aspect of the process which impels man towards more and more complex forms of interaction—that is, levels of equilibrium—remains to be explained. Man even likes to construct projects and set himself ideals which he knows are unrealizable within his lifetime. This suggests that the individual cannot reasonably hope to reduce the tension which he has created in himself. Furthermore, the values which man thus pursues are often so dear to him that he is prepared to sacrifice himself to protect or further them, as, for example, liberty, homeland, truth and religion, all of whose very strong motivational power may be observed in social and individual life. In any case where an individual subordinates himself to an 'objective' value, it is difficult to bring motivation within the framework of a need-reduction schema (Allport, 1946, p. 342). The mechanism of reduction, therefore, can only represent one of two parts of the motivational process. In fact, it should be emphasized that the formation of new objects is one phase of the motivational process itself, since it does not arise automatically as physiological needs do. Hunger automatically creates a new state of tension a certain time after eating, but the formation of aims and new tasks is a psychological activity which is an integral part of motivational process in man (*vide supra*, pp. 20–21).

C) Experiments on the gradient of goals (*vide supra*, p. 57) show that motivation increases with proximity to the goal. This makes the idea of progressive need-reduction through intermediary acts doubtful. We are told that the intermediary act was learned because it produced a partial reduction of need. If tension is partially and progressively reduced during the sometimes long series of intermediary acts, it is difficult to understand why tension is greater when nearer the final goal. On the other hand, the process which allows the higher species to establish and make use of means to an end plays a particularly important role in motivation. It should be studied for its own sake in connexion with the development of the cognitive functions which influence needs (*vide, inter al.*, Tolman, 1932, Köhler, 1921; Schiller, 1957; de Montpellier, 1949, pp. 171–260).

To sum up, it does not seem possible at present to formulate *one* underlying pattern which explains the effect of motivation on behaviour. The idea of reduction of tension can be useful only if certain processes are also taken into account, such as the fact that the organism does not aim for complete relaxation but for a maximum of tension, that motivation increases when nearing the goal and that an essential aspect of the motivational process consists in the active construction of new tensions.

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Chapter 16

The Emotions

Paul Fraisse

1 The nature of emotions

1 The two aspects of emotion

For a long time man was more interested in the control of his passions than in understanding his emotions. But once the nature of emotions was examined it was natural, particularly in this post-Cartesian dualistic age, that he should become aware through his own experience of their twofold aspect: on one hand, emotional disturbance, on the other, organic.

This twofold aspect is disconcerning. Eighteenth- and nineteenth-century philosophers and psychologists were unable to formulate a coherent view of emotions. The most likely and usual approach was mentalistic, i.e. that organic changes are a consequence of psychical events. Herbart (1824–25)[1] formulated this theory very clearly. The fundamental psychological fact is representation. Sentiments indicate a relationship of agreement between representations. Emotion is a mental disturbance produced by discord—which nowadays we call conflict—between representations. The picture of my dead father, placed next to that of my living father, makes me sad. In its turn, this emotional state, by a kind of reflex, involuntarily produces tears and more generally those organic disorders characteristic of suffering.

This is not the only tradition. The seventeenth-century sensationists La Mettrie, Cabanis and even Bichat and Buffon more or less clearly confirmed the influence of organic reactions on mental events. One of Dufour's most characteristic texts (1883)[1] says '. . . have I not adequately proved that our natural tendency towards passion does not come from the soul but from the disposition of the visceral nervous system which transmits to the brain the excitement it has received; that if our will is powerless to control circulation, digestion and secretion, it cannot be held responsible for the exaltation and disorders which our passions implant in them.' (p. 388.)

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[1] Appears in French translation in Ribot's *Contemporary German Psychology* 1885).

A similar tradition was represented in Germany by Volkmann (1885) among others. But the prevailing viewpoint in Germany in the second half of the nineteenth century was obviously Wundt's, whose work followed similar lines to Herbart, but with more eclecticism. Emotions are primarily internal modifications characterized by 'the immediate effects which sentiments exercise partly on the course of representations and partly on the reactions of this course to sentiment' (1886, II, p. 371). What about physical reactions? Wundt sees them only as a 'consequence', although he admits that the 'bodily consequences of the emotions react in their turn on the workings of the spirit' (1886, II, p. 374). In his Leipzig laboratory, two methods were used to study emotion, each corresponding to one aspect of emotion: the *impressive* method at the basis of introspection and the *expressive* method of recording organic reactions, principally respiration and pulse rate (Lehmann, 1892).

2 *W. James's theory*

The modern history of emotion begins with W. James's article 'What is emotion?' published in 1884.[2] For the first time an author formulated a clear, coherent theory of emotion which was to be elaborated and defended for almost 20 years. This is the resumé given by W. James himself in his *Précis of Psychology* (1908, p. 499): 'Our natural way of thinking about these strange emotions is that the mental perception of some fact excites the mental affection called the emotion and that this latter state of mind gives rise to the bodily expression.

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[1] This text was brought to light by Titchener (1914) to show that W. James had not invented anything.

[2] The following year a Dane, Lange, working quite independently, published a work translated into French by G. Dumas in 1894 under the title *Les émotions*. Lange's theory was in principle the same as that of W. James. Psychical emotion is only the consciousness of cerebral, muscular and organic variations: it is true that he later added that all these changes depended on the circulation of the blood. This supplementary point of view may be compared with the role Cannon attributed to circulation in the dispersal of adrenaline discharge (*vide* pp. 109 and 145).

'My theory, on the contrary, is that these *physical changes follow directly from perception and that it is our awareness of them as they occur which constitutes the emotion.*'

The order of the different phases referred to should be emphasized: (1) perception of a situation; (2) organic changes; (3) awareness of these changes. This being said, all W. James did was to reverse phases 2 and 3 in comparison with common sense and mentalistic theories, but he remains within the framework of dualist thought and his theory involves all the difficulties of introspective psychology.

It is, in fact, a theory. If there is an observation it is limited to what everyone may attain by introspection. W. James himself found no other foundation for his theory. '*If we imagine some strong emotion and try to abstract from our consciousness of it all the feelings of its bodily symptoms* we find we have nothing left behind. . . . It is true that although most people when asked say that their introspection verifies this statement, some persist in saying theirs does not.' (1908, p. 503.)

W. James has no reply to this. His theory can be neither proved nor disproved, because one of the conditions eludes all verification.

W. James is certainly right in saying that there is a close connexion between the emotions we feel and our expression or physical response. Actors recognize this fact: it is difficult to assume one expression intentionally and feel another. A smile through tears brings a feeling of relief from pain. Using the technique of hypnosis, the same phenomena are found: a subject cannot adopt a motor attitude characteristic of one kind of emotion and at the same time feel another. Either he modifies his expression or he cannot feel the new emotion required of him (M. Bull, 1951). At the most, the facts demonstrate the existence of a relationship between the organic and psychic aspects of emotion; however, W. James claims more than this: namely, that awareness of physical disturbance constitutes emotion.

3 Objections to W. James's theory

As this theory can be neither proved nor disproved, any objections to it lack foundation, but since they constantly reappear, it would be useful to examine them in some detail.

One was suggested by W. James himself: emotion increases when its physical expressions are checked (repressing a wild laugh). Conversely, it is recognized that weeping relieves grief. He easily deals with these apparent contradictions of his own theory by remaking that '*during* expression emotion is always felt'; it is no longer felt *afterwards*. On the other hand, the first emotion may even be transformed through the changes occurring during physical upset. Thus to hold in laughter may bring on another emotion, and unexpressed reactions may be more violent than those which are expressed.

Other objections have been summarized and formalized by Cannon (1927).

A) If all afferent pathways supplying the viscera are cut off, emotional behaviour still occurs. Sherrington was the first to attempt a verification of the James-Lange theory by carrying out a cervical transection of the medulla and even of the two pneumogastric nerves. Cannon went even further by sectioning the ganglion system. De Somer and Heymans (1912) studied dogs' and cats' heads entirely separated from the body which were kept alive by cross-circulation with other animals of the same species. In all cases it was observed that the animals' facial expressions showed the whole range of emotions—fear, disgust, anger, etc.—in the presence of a stimulus capable of arousing an emotion.

This objection is not valid because experiments of this kind carried out on animals do not allow us to draw conclusions about man. We cannot know if the animal feels an emotion or not. There is only emotional mimicry. Moreover, it would be a grave error to think that W. James regarded this mimicry as the external expression, of a state of awareness, since he believed the sources of emotion were in the viscera. On the contrary, facial reactions are part of these peripheral reactions, which are sources of emotion. However, even when anaesthesia is considerable it is never complete and the cerebral nerves continue to send messages to the cortex. This kind of experiment, therefore, does not provide data for determining the validity of W. James's theory.

B) The same widespread and common visceral reactions occur in all emotions; furthermore, these reactions appear in organic states which are not part of emotional reactions. The first objection has not been entirely proved and the question of the existence of specific configurations of emotive reactions will be raised later (p. 167). The reply is certainly affirmative if visceral reactions and those of the striate muscle are considered together—and James does not separate them.

The second objection refers only indirectly to James's theory. He never claimed that all organic change was a source of emotion.

C) The viscera are relatively insensitive. This is true, but even the most ordinary experience shows that our vegetative system is not a source of sensations during normal functioning but, on the other hand, when vasomotor disorders, digestive troubles and relaxation of the sphincters occur we are warned by various sensations which can be very intense. Furthermore, W. James never limited the organic sources of emotion to the viscera. He also referred to flight, laughter and tooth-grinding which do not depend directly on the neuro-vegetative system.

D) Finally, artificially induced visceral changes characteristic of certain emotions do not produce the emotion itself. Injections of adrenalin may bring on a kind of erethism, a particular state of sensitivity in which emotions can be experienced, but not an emotion itself. There is no parallel between the organic reactions experienced and the emotions felt.

However, it must be repeated that W. James never stated that all organic disturbances caused emotion. Insufficient attention is paid to the fact that he regarded organic reactions and emotion experienced at its source as the same thing: the *perception* of an object (and by object he stated as early as 1894 (*vide* 1910, p. 144) that it meant 'the whole situation' as made up of everything the object suggests) in other words *perception of a situation*. If he had gone further into the nature of the relationship between perception of this object and the subject's reactions, he would have been in advance of our present beliefs. His merit was his insistence on the fact that organic reactions are not an epiphenomenon or the result of psychological emotion, but the direct result of the perception of a situation.

4 *Emotion as behaviour*

The idea that emotion should not be considered principally as a psychic state but as a response of an organism to a situation already underlies Darwin's work. This is quite a natural attitude, moreover, for one who began by studying animals, where only behaviour can be studied scientifically. According to Darwin (1872) many emotional responses can be explained simply by virtue of their usefulness (the expression of anger frightens the adversary) or because they are vestiges of behaviour which had been useful in an earlier stage of evolution.[1] For example, if the hands are damp with fear, this is because it helped our simian ancestors to grasp the branches of trees. Dewey (1894–95) also considers the question of the significance of emotion and because of his functionalist viewpoint partly avoids a dualistic approach which would have polarized a useless discussion. He combines, in one sense, the points of view of Darwin and James, but refuses to consider the problem of the chronological order in the development of emotional behaviour. Instinctive co-ordination takes place between the perceptual act and the organism's reactions. Moreover, perception, as an active process, implies that the object or situation is perceived not only as such, but together with its emotive value: we perceive a bear not only as a bear but also as a dangerous animal. However, Dewey goes still further. 'The mode of behaviour is the primary thing and the idea and the emotional excitation occur at one and the same time . . . they represent the tension of stimulus and response in the co-ordination which determines the behavioural modality' (1895, p. 19). Every act has this double aspect, but emotion occurs only when instinctive, normal or voluntary action is thwarted. To fight or even to run away produces no emotion when these acts are normally accomplished; but should a difficulty arise, then man, in his effort to adapt to conditions of life, feels emotion. 'The emotion is, *psychologically speaking, the adjustment or tension between habits and the ideal,* and the organic changes which take place in the body are the literal working out in physical terms of this struggle for adjustment' (1895, p. 30).

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[1] Darwin also referred to two other less interesting principles. The second, the principle of antithesis, states that certain emotive expressions are simply the opposite, from the physical point of view, of a useful emotion. The third principle explains useless reactions simply in terms of the structure of the nervous system.

This theory of emotion as the outcome of conflict brings us closer to the most recent theories. It was adopted by Claparède (1928), among others. 'Emotions occur precisely when adaptation is hindered for any reason whatsoever. The man who can escape does not experience the emotion of fear' (p. 126).

Watson (1919) goes much further; what we feel does not matter very much. Emotions are the reaction of the organism, that is to say, 'a hereditary pattern of responding which involves profound changes of the physical mechanism as a whole and particularly of the visceral and glandular systems' (p. 165).

So the idea that emotion is the organism's reaction to a situation was born. The immediate effect of this theory is to reinforce an aspect of W. James's work which is less concerned with the psychology than the physiology of emotion (Sherrington, Cannon, Bard, etc.). By so doing, too little attention is given to the psychology of emotion. French psychopathological or psychophysiological investigations, however, increased our understanding of this aspect of emotion.

P. Janet (1) took work on emotion an important step forward. He was the first to speak of 'the behaviour of emotion'. He reached this idea because pathological psychology, being concerned with animals, caution against abuses of both introspective and physiological simplification. 'Emotion,' says P. Janet, '. . . arises directly from perception of the situation' (p. 458) and he considers first its effects in relation to action. 'Emotion seems to possess a power to dissociate and analyse, emotion is above all a disorganizing power' (p. 464), and 'it is this sudden elimination of all adapted acts, of all search for adaptation, this disorder, this spread of agitation throughout the organism which seems to us an entirely different phenomenon from other forms of control and which is the true characteristic of emotion' (p. 467).

Thus emotion causes loss of memory, disturbance of habits and in general a substitution of easy actions for more difficult ones. It suffices to say that 'the disorganization of the superior action is not an automatic result of the event but is actively produced by the subject's response' (p. 472).

Piéron (1928), who studied automatic responses in the crab, was also concerned with the nature of emotion. 'It consists primarily of an abnormal discharge of nervous energy, a discharge which exceeds the quantity which the individual requires for normal reactions and which may even be produced when there is no reason to react' (p. 294).

Janet made a decisive contribution. Emotion is no longer considered as merely an internal experience or as a physiological disturbance, and so the precedence of one aspect over another no longer presents a problem. Emotion is the reaction of the total personality (including the body) to situations to which it cannot adapt itself. Its significance is essentially functional.

5 *The levels of arousal*

The progress made in the physiology of emotion, however, was to call into question the idea of specificity of emotion. As soon as psychologists' interest was drawn to the study of the organism's physiological reactions (respiration, pulse-rate and blood pressure, PGR, biochemical reaction, secretion) they observed that these increase long before the subject feels emotion, and they gradually conceived the idea that there are different levels of activation of behaviour and that emotion is only that corresponding to a very strong activation.

This idea is first to be seen in Cannon's work beginning in 1915. He discovered that in the cat secretion of adrenalin by the adrenal glands increases with the slightest movement, the increase growing with activity and becoming very great when a cat is in the presence of a dog or when it has to fight. From these facts Cannon developed this theory of the *emergency reaction*: physiological changes prepare us to cope with the requirements of action, and provides us with the energy needed in fear, anger or pain. Of course, the secretion of adrenalin is in itself only an effect of stimulation of the sympathetic nervous system, but it reinforces this effect and gives it its direction.

This theory is useful in that it draws attention to the mobilization of energy which reaches its climax in emotion. This somewhat ambiguous expression was later used by Duffy in 1951, who since 1934 has strongly defended the concept of a continuum of different levels of activity and even questioned the usefulness of the idea of emotion (1941).

Recent discoveries in neuro-physiology have confirmed and developed these points of view. By progressively stimulating the reticular formation (see p. 121) it is possible to follow the different states which succeed each other in the animal, through the range of levels of consciousness from deepest sleep to rage or fear. The physiological signs corresponding to each of these states may be determined by electro-encephalography or by measuring the intensity of the response electro-dermographically (or psychogalvanically by the PGR). So it becomes possible to consider behaviour as being dependent on a level of arousal which may increase progressively from sleep to paroxysmic states. This was the view presented by Lindsley (1950, 1951) who had taken part in the fundamental research carried out by Magoun. From a basically physiological point of view, it is no longer necessary to consider emotion as a specific phenomenon. Emotional reactions are only one of the extremes of a continuum where it is possible to distinguish every level of activation.

This point of view is quite correct if the physiological aspect of emotion alone is considered. Emotional responses at the physiological level are conspicuous by their quality rather than quantity, making it impossible to trace any boundaries on this continuum of intensity. However, these reactions only have meaning when considered in conjunction with behaviour relating to particular situations.

6 *Motivation and emotion*

Psychologists particularly concerned with emotion as a total affective response have also envisaged a continuum ranging from attitude to emotion. Their position, like that of physiologists, is understandable. If one aspect of an emotional reaction is considered, it is found to be common to the emotion in question and to less intense reactions. Can one conclude from this that emotion is only a question of degree?

To return to emotional behaviour, this is obviously only found when motivation becomes very strong. Before scientists, etymology established the relationship between motivation and emotion, both of which come from *movere*. Motivation and emotion stir the organism, but the *e* (ex) of the word 'emotion' indicates an orientation of movement. It is emotion which stirs one 'out of oneself' and the common use of the word supports this interpretation.

Between motivation and emotion, there is both continuity and discontinuity. Sufficient motivation is essential if one is to deal with problems set by the environment. However, if we are too strongly motivated, we are unable to adapt so well to reality, and traces of emotion appear in behaviour so that sometimes emotional responses completely take the place of adaptive action.

There would seem to be a degree of motivation above which emotional behaviour appears. This notion of a maximum degree of motivation is relative to the suitability or non-suitability of responses in a certain situation. This relation corresponds to a connexion between the intensity of motivation and the subject's capacity to face up to the situation. As Hodge said in 1932, 'emotional reactions are inversely proportional to the ability of the higher centres of the brain to meet a given situation'. Psychoanalysts say the same thing in different words: 'It may generally be considered that an emotional reaction which is abnormally intense is derived from something which had formerly been repressed . . . emotional attacks occur when the normal control of the ego has become inadequate through (a) an abnormal influx of excitation; or (b) a previous blocking of the discharge flow' (Fenichel, 1953, p. 24).

It is quite possible to reconcile this view with the existence of a continuum of internal experiences ranging from weak to violent feelings—in the same way as on the physiological level a continuum ranges from weak to strong activation.

7 *The optimum of motivation*

The idea of an optimum of motivation is essentially as old as human thought, and moralists have always condemned extreme passions which cause man to lose his self-control.

Using various different ways of expressing it, psychologists also recognized that an intense level of stimulation harms our efficiency, or, better still, our adaptation to the continual problems which our environment imposes on us. As Piéron said as early as 1920: 'Objectively emotion appears to involve a degree of reaction which is more intense and widespread than those directly adapted to the stimulus' (1959, 2, p. 149). Even psychologists who emphasize the activity continuum notice this maladaptation which is produced when the situation becomes too intense. For example, Lindsley (1957) observes that when arousal becomes intense in man, his efficiency is reduced and he shows signs of disorganization and lack of control. However, the experimental demonstration of an optimum of motivation is much more recent since it is difficult to experiment with emotions. The first studies which investigated this optimum did not refer to emotion properly so-called, but strove to find a relationship between the level of activation and the quality of performance. Yerkes and Dodson (1908) were the first to demonstrate an optimum of motivation in animals. Their important contribution will be discussed in the following paragraph. Duffy (1932) observed that children showing the greatest strain (measured by dynamographic pressure) were also those who gave the poorest performance. This suggests once more the existence of an optimum of tension which varies according to the task and the individual.

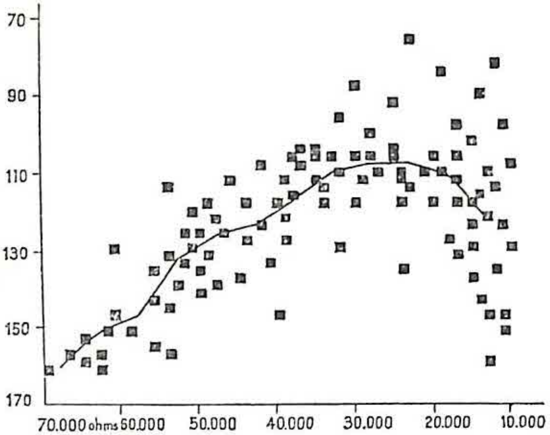

Fig. 1. The relationship between palmar skin resistance and reaction-time performance in a single subject in various states of alertness. (From the relationship between performance level and bodily activity level, by G. L. Freeman, *J. Exp. Psychol.*, 1940, 26, 606.)

The most significant experiment was made by Freeman (1940) who measured on one subject a short series of reaction times simultaneously with the level of skin resistance (PGR). The results of these measurements over several days at different times of the day are shown in Fig. 1. The optimum of arousal emerges quite clearly. Disbelieving the evidence, Schlosberg (1954) repeated the experiment and in addition to the reaction time measured hand steadiness (degree of trembling) and found the same curve when both tests were compared with the skin conduction test.

In addition to those results on an indeterminate continuum of arousal using physiological measures, there are those which show that the quality of performance improves with increased motivation, but only up to a certain point: when too much is at stake, performance deteriorates.

This is a commonplace phenomenon. Many students lose their skill on examination day. Military officers know that forces manoeuvre better during exercise than during combat. It has been estimated that under fire only one-third of the troops would fire on orders.

An experiment by Stennett (1957) showed the relationship between arousal, motivation and performance. The task consisted of auditory tracking, that is, the subject has to turn a knob to eliminate a noise, the zero point being periodically changed by a programmer. After a learning period, three levels of motivation are studied:

1. weak: the task is presented as testing of apparatus;
2. medium: small rewards for success;
3. strong: considerable reward for success, electric shock when a certain degree of failure is recorded.

Arousal measured by the PGR and the level of tonicity (EMG of the active and inactive arm) increased from situation 1 to situation 3, but the best results were obtained in situation 2.

Freeman (1948, p. 112) generalized these results and worked out an abstract curve for the phenomenon (Fig. 2). He clearly identifies the loss of efficiency in an emotional reaction. This was not apparent in early research where strong arousal, measured by muscular tension or decrease in skin resistance, did not signify that motivation was at its optimum.

Although we have reproduced Freeman's model exactly, we do not agree with his formulation of variables on the ordinates and more particularly on the abscissa. If the formulation based on his general concept were followed to the letter, his general what we have called arousal level, would be merely the effect of the energy supplied by stimulation. This strictly behaviourist point of view is not in agreement with either the psychological or even the neurophysiological facts which show that stimulation affects the reticular formation in proportion to the receptivity of the subject.

Hebb (1955) regards the situation as having a double action on the nervous system. It supplies information to the subject (*cue function*) and also works through the ascending reticular system to determine the level of arousal. When this level is raised and more complex situations require more delicate adaptation, interference occurs between the two systems (*cue function* and *arousal*) and performance deteriorates when there are anxious and emotional reactions. Starting from quite a different point of view, Hebb presents a curve similar to Freeman's.

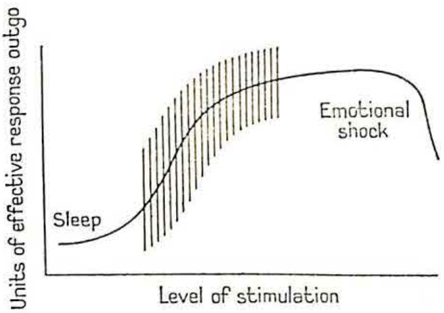

Fig. 2. The optimal reaction range. (From *The energetics of human behavior*, by G. L. Freeman, Ithaca N.Y., Cornell University Press, 1948, p. 114.)

Malmo (1959) also proposed a curve of the same kind by directly relating the level of performance with the level of arousal. The deterioration of performance during strong arousal is obviously influenced by the nature of the task: a slowing-down in tests where speed is essential; clumsiness where precision is required. Learning is less rapid, intellectual performance is poorer. Maladaptation may be not only quantitative but also qualitative, and regression in particular may be observed in all fields. This will be examined in more detail in Chapter 12 which deals with the different forms of emotional reactions.

8 *Variations of the optimum: The Yerkes-Dodson law*

The optimum of motivation obviously varies with the task. Yerkes and Dodson carried out a fundamental experiment in 1908 which gave the same results with rats, chickens, cats and men. The task consisted of a choice based on discrimination between two degrees of brightness, one of the answers being arbitrarily incorrect. The task was fairly complex as there were three degrees of difficulty in discrimination. Also, three motivational levels were provided for in the form of a weak, medium or strong electric shock as punishment for error.

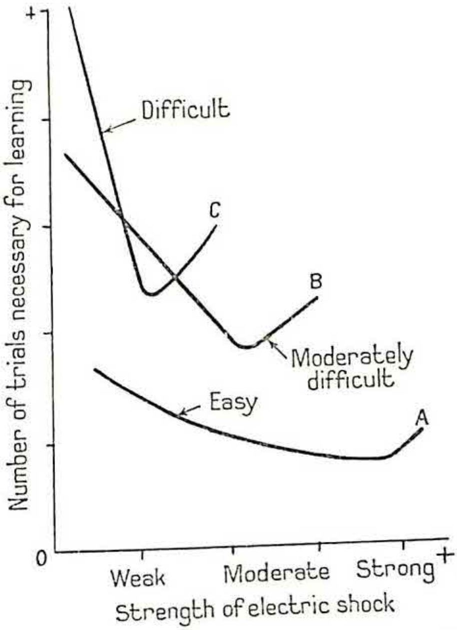

Fig. 3. Schematic diagram illustrating the Yerkes-Dodson law. (From *Emotion in man and animal*, by P. T. Young, New York, John Wiley and Sons, Inc., 1943, p. 307.)

The general results are given in Fig. 3. The abscissa measures the strength of electric shock and the ordinate the number of trials necessary to reach a certain criterion of discrimination. The three curves correspond to three degrees of difficulty of the task, They show that in each case there is an optimum of motivation for which learning is best. But what the results show especially is that this optimum depends on the difficulty of the task, so that the Yerkes-Dodson law may be formulated thus: 'When the difficulty of the task increases, the intensity of punishment which gives an optimum speed of learning approaches the threshold value.' This means that the optimum is reached with weak motivation when the task is difficult whereas it requires a strong motivation for an easy task. It is obvious that in simple activity very high motivation is not likely to upset behaviour, whereas this danger lies in wait for us when the task is difficult.

The same results have recently been found in rats by Hammes (1956) and Broadhurst (1957). Other studies have shown that an increase in excitation or, more generally, of motivation entails a decrease in reaction.

For example, Cardo (1961) studied the effect of amphetamine on a conditioned avoidance reaction in the rat. He noted that small doses improve this reaction while large doses give rise to disturbed responses.

Patrick's results (1934) with man also confirm this law. The subject is shut into a cabin with four doors, from which he must try to escape as soon as possible. A different door is left unbolted each time, but never the same one twice running. There is, therefore, no logical solution, but the subject may adopt a fairly rational strategy. If the motivation to escape from the case is increased by shooting nails at the subject or giving light electric shocks via the floor his strategies become less rational, more stereotyped and definitely more inefficient.

9 *Disturbance in adaptation and emotional organization*

Previous progress has led us indirectly to adopt a position on a question which has been much discussed during the last fifty years: is emotion a behavioural disturbance or, on the contrary, an organized reaction?

Darwin, Cannon and Leeper (1948) thought, in different ways, that emotion is useful and constitutes an adaptative process because it mobilizes energy in response to environmental demands. Most other psychologists, however, consider emotion to be a disturbance, a failure to act.

This conflict stems from the confusion surrounding the definition of the two terms; emotion and organization.

If emotion is understood to be the level at which an instinct or, more generally, a motive is activated, then emotion depends on adaptation. However, considering emotion in this sense means one is unable to describe and even less to explain the fact that a strong motivation brings with it a behavioural disturbance which is what Leeper recognizes.

We have thus supposed that emotion corresponds to this drop in the level of adaptation which occurs when motivation is too strong in relation to the subject's actual potentiality. It is inexact to speak of emotion as synonymous with sentiment, as in the expression 'an aesthetic emotion' or to use it whenever a subject is 'moved'. Emotion is fear, anger, pain, sometimes pleasure and in particular great joy.

The term organization is even more equivocal, when used to mean order as opposed to disorder. Up till now we have spoken only of a deterioration in performance, but it must now be recognized that this decrease represents disorder. We do not mean that the emotional reaction becomes disorganized, but we consider it in relation to a correct response, that is, the response best suited to a given situation. By the best-adapted response or the highest possible level we mean, with reference to P. Janet's theories, the response which takes into account as many facts as possible and is the most realistic. Anger substitutes violent words and gestures for efforts to find a solution to difficulties which arise (solving a conflict, getting round an obstacle). However, an emotional reaction such as anger is organized and has common traits which are found in all kinds of anger. It is also a response adapted to the situation (hitting an object or person who resists), but the level of this response is inferior to what it could and should be, according to cultural standards.

It is, however, necessary to go further into the aspects of what Hebb (1949) decided to call the emotional 'perturbation' to avoid any confusion.

There are levels in disorganization as there are levels in organization of behaviour.

Take the example of a candidate at an oral examination who is over-motivated in proportion to his abilities. At a low level of disorganization, emotion may show itself by unaccustomed and useless neuro-vegetative reactions—damp palms, hypertonicity, difficult digestion, somatic upset. These organic disorders, if they are not too strong, may still be compatible with excellent performance at the examination. At a higher level of disorganization, the candidate partly or even completely loses his mental faculties; disorder affects mental activity itself—confusion, loss of memory, speech-block. The neuro-vegetative manifestations become stronger—tears, blushing or growing pale, or even fainting.

Wallon (1949), in different terms, states that one's adjustment to life is disturbed and to a certain extent invaded by signs of a hyper- or hypotonicity of the neuro-vegetative system and of the various postures.

The question of knowing whether emotion represents order or disorder should not be confused with knowing whether or not it is useful. In animals, emotional reactions are more stereotyped than in man and each species has its own distinctive responses. The anger of a dog, the fear of a cat faced by a dog are doubtless useful to these species. Man has, in addition, the possibility of building upon what may only be a disorder to begin with.

10 Social use of the emotions

As P. Janet and Wallon have shown, emotional responses may be considered as a form of adaptation to the situation. The candidate (often a woman) tries to influence the examiner by arousing his pity if she cannot give satisfactory intellectual answers.

P. Janet (1928, p. 471) tells the story of a woman patient who, having explained her case to him, burst into tears and gave way to a fit of hysteria. He observed that she found it easier in some ways to use tears than explanations to appeal to the doctor whose help she desired.

Children's caprices have a similar finality. The child soon discovers that his emotional responses, originally arising from physical pain, exert an influence over his family circle through the phenomena of emotional contagion (see p. 135). What started as a semi-reflex response becomes a weapon to use on those around him. As a child of five said: 'I shall go on crying until you give it to me.'

As Wallon has closely observed (1949, pp. 75–9), emotion becomes a social form of behaviour by dramatization and imitation thus performing the functions of a language which has more emotional significance than mere words. Often in the very throes of emotion, the person is able to observe its effect on those around.

This socialization of emotional disturbance is produced in two ways which should be distinguished:

(a) utilization of organic upset to influence others: tears in the hope of pity, signs of fear which are in effect a call for help;

(b) reorganization of behaviour which transforms emotional responses into those relatively adapted to the situation.

In childhood anger, crying, stamping and rolling on the ground are examples of the first kind, whilst hitting at the obstacle, whether it be a physical barrier or a person, is a form of aggression already related—however slightly—to the difficulty encountered.

Changes in emotional responses can be clearly observed in the course of development. Goodenough (1931) showed this in a study conducted with mothers of 45 children aged 7 months to 7 years 10 months. These mothers were asked to describe 2,124 fits of anger in their children. It appeared that they could be divided into two categories—undirected outbursts and those which, on the contrary, sought to reach directly, or more indirectly, the person responsible for the fit of anger—such as performing a forbidden act or breaking something. The following table shows the relative percentage according to age of behaviour which could be clearly classified in either of the two categories:

Ages	*Less than 1 year*	*1–2 years*	*2–3 years*	*3–4 years*	*4–8 years*
Outbursts	88·9%	78·4%	75·1%	59·9%	36·3%
Directed anger	0·7%	6·3%	10·6%	25·6%	28%

It appears that when man is unable to control his reactions he directs them in such a way as to gain some benefit from his behavioural confusion.

Although appearing progressively throughout development, it may occur at any time when an individual is subjected several times to the same provocative situation (the schoolchild being teased, the adolescent in contact with the other sex, the soldier in battle, etc.). At first, conflicting feelings outweigh other emotions but emotional reactions are gradually integrated into the individual's defence system, and are sometimes replaced by totally adapted behaviour.

To recognize this function of emotion does not mean one necessarily agrees with Sartre who, anxious to give significance to emotion, turned it into a magical form of behaviour which could transform the quality of people and things. The organic phenomena would convey only the 'seriousness' of the emotion. However, Simone de Beauvoir (1960, pp. 134–5) reveals that Sartre, at the time he wrote his essay, did not believe in activity peculiar to the neuro-vegetative system. Hardly astonishing, therefore, that he should return to the inspiration of an intellectualist position! However, his brilliant thesis is much further from the facts than those of P. Janet or Wallon, and in particular he overlooks the social aspect of emotion.

11 The neural centres of emotion

Even though some allusions have already been made to physiological data, we have up till now been discussing the nature of the emotions at the behavioural level. It is now necessary to examine the findings of neurophysiology, which are taken mainly from animal research although the most important results seem to be applicable to man also.

(A) BEHAVIOUR DURING RAGE

The first knowledge about the centres controlling emotional behaviour was provided by the behaviour of animals whose cerebral hemispheres had been removed (Goltz, 1892; de Barenne, 1919, cited by Cannon, 1928). These animals responded to different stimuli by showing signs of rage—physiologists use the word rage for both anger and fear which are difficult to distinguish from each other in animals. Cannon constructed his thalamic theory of emotion on the basis of this work. However, in 1928 Bard, also using the ablation method, showed that the most important zone was the posterior hypothalamus, which in the cat is only a quarter of a cubic centimetre in size. Rage responses are integrated in this centre, which is also the area responsible for neuro-vegetative activity.

At this stage it was considered that the centre controlling anger and fear had been established, the cortex having an inhibitory and co-ordinating role in relation to it.

However, progress in neuro-surgery and above all in electrophysiology, which brought about the possibility of permanently implanting electrodes in animals and performing localized destruction by electro-coagulation, caused this theory to be revised.

On the basis of clinical observations, Papez (1937) thought there must be an integrating centre of experience and emotional reactions in the cortical region, and he located it tentatively in either the gyrus cinguli or the hippocampus. MacLean (1949) generalized this theory by referring to a visceral brain—the rhinencephalus, which is closely connected with the hypothalamus and all the afferent areas of the cortex. It is now known that the rhinencephalus is not only by etymology the olfactory brain but is composed of several structures of which the hippocampus is the most important. These deeper structures are part of the telencephalon from which they receive information, but they are closely integrated with the diencephalon.

Research over the last ten years confirms the role of the rhinencephalon. Present-day knowledge may be summarized as follows, according to Gastaut (1957) and Magoun (1960):

The excitatory state corresponding to rage is produced in the cerebral trunk, comprising the reticular formation, the mesencephalon and the posterior hypothalamus.

This excitation when produced in decerebrate animals, gives rise to reactions which have been called *sham-rage* or pseudo-rage because they differ from those which are produced by normal animals in the same situations. These reactions are more intense but limited in time to the duration of the stimulus; they are uncoordinated and the defence reactions are not adapted. The expression *sham-rage* also means that the animal does not experience its emotion.

These reactions of the diencephalic centres depend on the rhinencephalic formations which have both inhibitory and activating roles. The inhibitory role was demonstrated by the ablation of the rhinencephalus which raises the threshold of rate reactions, and the activating role was demonstrated by the fact that stimulation of the amygdaloid complex, the fornix and the hippocampus provoke reactions of fear and anger in unanaesthetized animals.

Finally, the centres of emotion are controlled as a whole by the neoencephalon which, in addition to its general inhibitory role, has a double function:

(a) It greatly increases the number of stimuli which provoke rage. It is clear that the organization of the cortex which contains so many afferent and association areas increases the discrimination of stimuli and allows conditioned stimuli to be effective, whereas the inferior zones only operate reflexively.

(b) It makes aggressive behaviour more adapted to the situation. This point is of prime importance. If the decorticated dog's tail is pinched, he howls, dribbles, tries to bite empty air, whereas the normal dog has the same anger reactions but directed towards the person responsible. This co-ordination also occurs as soon as the rhinencephalic area is excited. Piéron (1928) rightly observes that emotional reactions are characteristic of animals with highly-developed association zones. The others have fairly intense adaptative reactions which do not, however, have the character of disorganized emotional release (in relation to the situation). Emotions play the most important and differentiated role in man, due not to the development of the sub-cortical centres but to the importance of his cortex.

Piéron remarked that it was as if the associative centres were a reserve of nervous energy which would be liberated by an emotional shock and invade the organs of vegetative and motor activity. Today it would doubtless be more correct to say that because of the growth of conditioned responses, these centres multiply the action of stimuli which carry emotional significance and this multiplication makes adjustments to vital situations more difficult still. In the case of the examination candidate, he would be less disturbed if he were less sensitive to the atmosphere of the examination room and if he were incapable of imagining present and future consequences of failure.

Research carried out during the first half of the twentieth century elucidates the functions of the different stages of nervous structures in emotional behaviour. However, the technique of extremely accurate excitation by micro-electrodes in all parts of the animal enabled the effects of excitation on the different centres to be measured: the technique used is conditioning. If an unconditioned response, produced by direct excitation of a centre, can be conditioned to a neutral stimulus, it is clear that there was a connexion between the two excitations, that is, that the cortex was affected, which some interpret in terms of subjective experience. Masserman (1943) was unable to condition rage reactions caused by hypothalamic stimulations to a neutral signal, but since then Delgado and his fellow-workers (1954, 1955, 1956) have demonstrated the possibility of direct excitation of the spino-thalamic tract, the posterior ventral nucleus of the thalamus and the hippocampus (see Magoun, 1960). Lilly (1957) has even been able to teach monkeys to switch off the electric current of the machine transmitting excitation to the hypothalamus as soon as the intensity of the stimulation reached one-fifth of that necessary to provoke panic fear reactions. In this case, it must be admitted that excitation transmitted information to the cortex (see Gastaut, 1957). Finally, it should be added that, on the level of subjective experience, properly so called, stimulation of the amygdala in non-anaesthetized humans brought on fear as well as the characteristic somatic and vegetative reactions (Chapman, 1954, cited by Gastaut, 1957). It is generally thought that the subjective components of emotion are produced in the rhinencephalus.

Up till now we have considered only the behaviours of rage, anxiety, fear and anger. We have seen that they depend on a hierarchy of structures, but, with Gastaut (1957) it is important to point out that in their primitive form they are a prolongation and differentiation of the startle response which depends on sudden excitation of the reticular formation of the lower brain stem (from the neck of the bulb to the upper hypothalamus).

(B) BEHAVIOUR IN PLEASURE AND JOY

One thing must be made clear. Within our present perspective, pleasure is not an emotion and this is true even of sexual pleasure (which brings intense neuro-vegetative and somatic processes into action), in so far as the sexual act takes place normally. Animal copulation justifies this point of view and the intensity of our subjective experiences should not be allowed to mislead us.

Joy may become emotion when its intensity causes us to lose control of our reactions: agitation, logorrhea, even wild laughter are evidence of this.

Until a few years ago, it was impossible to isolate the centre of these reactions. We could produce rage, hunger or satiety, and sexual drive by local stimulation of the hypothalamus, but not reactions of joy or even satisfaction. However, as Delay (1946), Foerster and Gogel showed, as long ago as 1933 during operations on the base of the brain, excitation of the hypothalamus by compressing the pavimentum of the third ventricle produced a manic type of euphoria with its sequelae of exuberance, logorrhea and flight of ideas.

Olds' experiments (from 1954 onwards), moreover, showed the existence of a nervous zone whose excitation produces a positive reinforcement of behaviour. Using a Skinner box, Olds implanted permanent electrodes in the cingular cortex of rats, the amygdaloid complex, the septum, the hippocampus, the thalamic nuclei, the anterior hypothalamus—that is, in the areas of the rhinencephalon and the anterior part of the brain stem. He then discovered that the animals, far from running away from electric stimuli, voluntarily press a pedal to stimulate themselves. The frequency of this auto-stimulation varies according to the placement of the electrode and the organizing state of need, but it can reach 8,000 stimulations per hour.

It is probable that the animal stimulates itself in 'search of satisfaction'. It might be said, therefore, that the centres of joy are known.[1] It is remarkable that excitation of these centres by the experimenter never brought on reactions of satisfaction, not to mention joy, which seems the perquisite of primates. Laughter, in any case, seems to depend on the basal nuclei.

To sum up, we can only observe that although we now know a great deal about the centres controlling fear and anger, much less is known about the centres controlling emotions of joy, but it may well be that they are situated in the same areas. It is easy to go from laughter to tears.

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[1] MacLean (1954) also found that electrical or chemical excitation of the posterior cingular gyrus increased reactions of pleasure in cats which were stroked (from Arnold, II, p. 46).

2 Moving situations

A moving situation is one in which there is an excess of motivation in relation to the actual possibilities of adaptation of an individual. Beginning with this very general principle, we will try to identify the kinds of situation which most frequently produce emotions, especially in man.

It should first be emphasized that there is no situation which is moving 'in itself'. The situation depends on a *relation* between motivation and the subject's abilities.

Motivation itself is a function of the relation between the individual and his environment. Of course situations tend to produce certain similar effects, but everyone reacts according to his needs, his experience and his emotionality (see Chapter 4). We shall, therefore try to characterize classic and general situations without attempting an exhaustive list. It should be remarked, by the way, that psychology, whether experimental or not, is usually interested in reactions rather than in moving situations. Young (1943) and Wallon (1949) are exceptions.

Firstly, we will try to regroup the causes of emotion in two ways according to whether the time-lag between the balance of motivation and subject's potentialities can be attributed to the one or the other factor.

1 Insufficient opportunities to adapt

Emotion often occurs because the subject cannot or does not know how to respond adequately to a stimulus. His uncertainty when caught off his guard is transformed into emotional responses by the pressing need to act when there is no real outlet in the environmental situation (Wallon, 1949, p. 67).

A tentative classification of possible situations may be made under three headings: the new, the unusual and the sudden, while taking into account the fact that many situations fall into more than one of these categories.

(A) NEW

New situations are those for which we are not prepared. The excitation produced can be discharged only through emotional reactions. The swimming-instructor, when he sees someone drowning, feels little or no emotion: he dives in; but the spectator on the beach who cannot swim and who remains powerless to help is moved.

This partly explains why the younger the child, the more he feels emotion. He is ceaselessly confronted, from birth to adolescence, with situations for which he has not yet acquired a system of responses. A baby placed in too hot a bath cries, whilst an adult adds cold water. This also explains why the repetition of a situation dulls or even deadens emotions, as the individual gradually develops adequate patterns of response to what was originally a new situation.

Conversely, the same principle explains why most animals feel less emotion than human beings. They have what amounts to an instinctive response system for almost all the stimuli to which they are sensitive. The greater the learning involved in necessary adaptation, the greater the risk of encountering new situations which give rise to emotional reactions.

While the appropriate reaction may be acquired, a decrease in emotional response may be observed during the learning process. Take the example of flight behaviour from a nociceptive stimulus: an animal is harnessed with one paw on a block which can be electrified. A sound or a light precedes the shock which produces pain response. At the beginning, when the animal sees the signal it struggles and shows strong anxiety at this new situation, but gradually it adapts itself to it and learns to lift its paw calmly to avoid the shock as soon as the signal is given.

Hebb's experiment (1946) on monkeys confirms the importance of novelty. Thirty chimpanzees were shown different fixed or mobile objects, representing animals, parts of monkeys' bodies, or human heads. The chimpanzees were afraid of these inert or dismembered bodies. Hebb interprets this as fear provoked by new stimuli to which the higher centres are not yet adapted, which is, in other words, the explanation we have just proposed.

(B) THE UNUSUAL

There are situations which, even if repeated, are always new because there is no 'correct response'. For example, a loud noise produces an emotional reaction at any age. It is obviously stronger in a very young child, partly because all emotions are stronger when education has not yet developed one's power to inhibit but also because a loud noise produces a tonic reaction of an archaic type 'probably caused, at this age when the acoustic fibres are not yet myelinized, by the reverberation of the sound rather than the sound itself, and by the solidarity of the auditory complex and the labyrinthine structure rather than the hearing itself' (Wallon, 1949, p. 100).

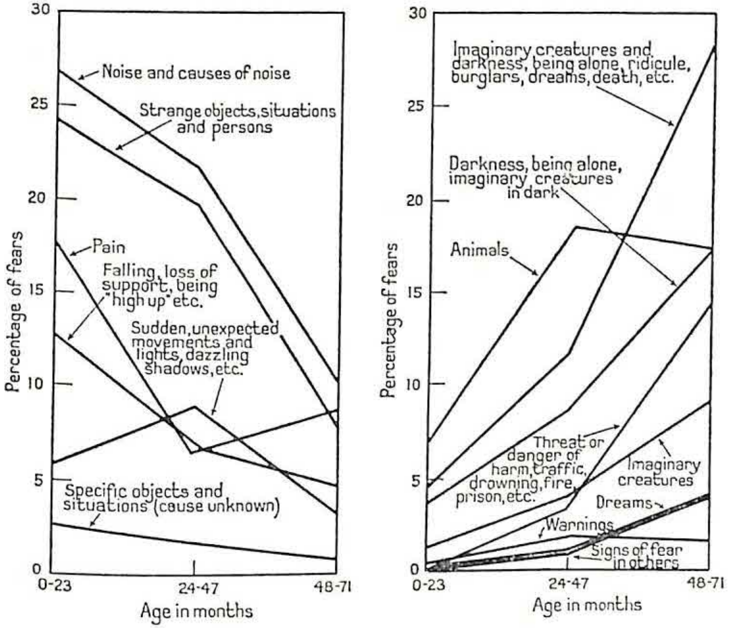

Fig. 4. Relative frequency of various fear situations as described by parents and teachers from 156 observation records of children for periods of 21 days (31, 91 and 24 at the respective age levels) combined with occasional records of 117 additional children (27, 67 and 23 at the respective age levels). (From *Manual of Child Psychology* by L. Carmichael.)

Reaction to loss of support, which Watson classed among the primary emotions, or even reflexes, is of the same type. Its modality evolves with age, but its emotive character cannot be denied. All 'postural uncertainty' produces a reaction of fear, Wallon adds.

To these unusual situations must be added those which remain potentially full of uncertainty whatever happens. This is the case with darkness principally and, to a lesser degree, solitude (which chimpanzees also fear) and products of the imagination.

Wallon (p. 102) emphasizes the fact that, for a child, the unusual may be a mixture of the known and unknown. A child may be terrified if he sees his mother wearing gloves or a hat on rare occasions. He is afraid of the stuffing which is pulled out of a harmless doll. The child is disturbed in his habits, he is not prepared for these unusual situations. They may even disturb him more than completely new stimuli which provoke only curiosity. This behaviour may be explained in terms of Hebb's (1949) theory that the origin of emotion is to be found in an alteration in the order of the stages of response.

The new and the unusual obviously increase in frequency when the child's age and experience increase. Fig. 4 shows the relative frequency of frightening situations for children of different ages. Development lessens certain causes of fear, but it also creates others, principally through the child's new ability to anticipate risks which he may run, without his as yet having the means to inhibit imaginary uncertainty.

(c) THE UNEXPECTED

'The prime cause of emotion is surprise' (P. Janet, 1928, p. 491). Emotion from surprise is one of the most familiar forms and also one of the most studied in the laboratory. In order to appreciate its specific quality, it must be distinguished from new and unusual stimuli whose suddenness often reinforces its emotive character. To take a pathological example from P. Janet (1928, p. 491), which illustrates the problem clearly, a young woman was waiting for a piece of furniture which she had ordered and which she wanted very much. It was delivered sooner than she expected and, instead of feeling satisfaction, she was very upset. She herself explained: 'If I had been warned, if I had seen the van from the window, I would not have been upset.' There was a time-lag between the rhythm of the action and that of wanting it. In such cases, the possibility of adaptation exists but the suddenness of the event prevents it occurring. We know that we must prepare our friends for bad news, and sometimes even for intense joy, if we wish them to avoid emotion.

Reactions to the new, the unusual and the unexpected are related. Their most elementary form is generalized excitement. Gastaut (1957) showed that reaction to surprise was the primary emotional response which corresponds solely to excitation of the reticular formation.

Excitation is in some ways the original form of all emotion. 'Excitement is our response to a situation which we recognize as calling for somewhat more than easy and routine handling', remarked Stratton (1928), who shows how excitement later varies between the two poles of depression and elation.

Bridges (1932) applies this schema to the genetic development of emotions. The first reactions of an infant are due to excitement; they are gradually differentiated. In the case of new and sudden excitation, apprehension turns into fear.

2 *Excessive motivation*

All things being equal as regards the subject's possibilities, it is obvious that anything which produces a strong motivation—hyper-motivation might be a better expression—will be the cause of emotional reactions. Here again there are no specific situations. We will review a certain number of standard cases, all of complex character.

(A) EXCESS OF UNUSED MOTIVATION

Hyper-motivation often springs from the divergence between the subject's state of motivation and the circumstances which do not allow him to act.

A) Excess of motivation before action: panic (stage-fright). Where a man is strongly motivated by a difficult action from which he cannot turn aside to think of something else, he feels panic or an anxiety which reveals itself in agitation and distressing neuro-vegetative symptoms. It is as if unemployed energy is being used up in emotional discharge. More often than not, the panic stops as soon as he starts to act.

B) Excess of motivation after action. Janet (1928, p. 477) recounts the story of a mountaineer who had slipped on a névé; after checking his fall and getting out of the névé, he reached a rock where he was no longer in danger. He then succumbed to a violent attack of trembling; 'My heart was beating,' he stated, 'my body covered in cold sweat, and only then did I feel fear and utter terror.' Newspapers recently carried the story of an accident when a film actress's car skidded and overturned; unhurt, she managed to escape by one of the windows, then fainted!

To these extreme cases may be added those of students' actions on reading their results (or, better still, at the posting up of results, as the situation is socially less compelling). Some clap hands, kiss each other and cry for joy. They have passed. Others grow pale, even cry. They have failed. The nature of the emotion depends on the result, but the cause is the same. The waiting period has called forth a supply of energy which serves no purpose. It is drained off in emotional reactions whose nature depends on the global situation. Those who saw the November 1918 Armistice remember the noisy agitated crowds who rushed around in the streets of villages and towns. Once the tension was over, nobody could keep still. A rough idea of this behaviour may be seen in a young child. Ease of movement is a source of excitement and it is easy to observe that in the young child 'joy comes with the ease of movement' (Wallon, 1949, p. 94). The child often laughs in his bath, or when he tosses about in his cradle. However, as Wallon adds (p. 98), 'there are people for whom work, instead of eliminating their need for activity, increases their irritability. Doubtless their character is such that movement creates more tonus than it can use up and the execution of the act does not exhaust the motives which brought it about. . . . There are impatient subjects who anticipate beyond what they have to do, anxious people who cannot act without excessive preparation . . . unskilful people who, lacking sufficient motor and intellectual ability to attain their intimate desires, transform their inability into irritation and anger.'

The light tickling which Wallon (1949, p. 51), prompted by an observation of Insabato (1921), regards as the source of all emotion, also produces joy. The state which develops as a result of proprioceptive excitation, which serves no specific purpose, is discharged in wild laughter, or may be transformed into tears if the excitation is too strong and the spasmodic discharge becomes painful.

This type of emotion is at the basis of many children's and adults' games. The idea is to set up tension in situations which have no serious consequences, generally some small anxiety which, when removed, produces agreeable emotional release. This is the principle of games where children frighten themselves the better to laugh about their fears. It is also the principle of *suspense* in plays. Bergson's contention that laughter is born of the incongruity between what is and what would normally be expected may be fitted into this schema. The unexpected which is not frightening and which calls for no action is interpreted by laughter. When Freud regards laughter as a defence mechanism, is he not saying the same thing? The subject rids himself by laughter of a state of excitement before the tension becomes painful.

All these cases refer to joyful emotions. Grief during mourning follows analogous laws. Frequently after the death of someone dear, social duties and many obligations use up one's resources, but during the days that follow, when the loss is still like an open wound, little is needed—sometimes only sympathy—for the repressed grief to break forth in sobs.

(B) THE EXCESS OF MOTIVATION IN SOCIAL BEHAVIOUR

Something which is easy to do alone becomes difficult as soon as a third person is watching. Wallon (1949, p. 94) remarks that it produces a showing off reaction which leads to confusion in postural attitude. P. Janet (1928, I, p. 495) has a more general explanation. Social conduct must take into account a more complex situation and is, therefore, more difficult. To transform individual behaviour into social behaviour is to subject it to the judgment of others or even to compete with them.

The confusion produced by this transformation is quite specific. No one likes to write with someone else looking over their shoulder and even intellectuals dislike drafting a text in the presence of other people. In social situations of an educational type, it is commonplace to see a child who succeeds well on his own become confused and stammer in class; he is said to have lost his wits.

(C) THE EXCESS OF MOTIVATION THROUGH FRUSTRATION

Frustration occurs each time a physical, social or even imaginary obstacle hinders or interrupts a step towards an objective.

Frustration then creates, in relation to the initial motivation, a new defensive motivation determined by the obstacle encountered. Old and new motivations find themselves blocked and usually unusable in motional responses. It is typical that classical reactions to frustration represent all types of emotional responses in the sense they have been defined above.

A) *Aggressiveness.* The commonest reaction to frustration is the development of generalized aggression and often it is directed against the obstacle. Where this happens the response is concerned with the removal or avoidance of the obstacle when possible; aggression, which may easily become anger, consists of violent and inappropriate responses.

When Watson describes the intense effort of the body as a primitive form of emotion, he is only referring to one form of privation to which the child is sensitive very early in life: deprivation of freedom of movement. Gates's study (1926) provides proof that irritation, aggression and anger are most frequently produced by frustration. He asked 45 students to make a note of the occasions when they felt irritated or angry for one week. Most of them result from frustration: accusations, injustices, sarcastic remarks, reprimands, waiting, being jostled, losing one's seat, encountering rebuffs, a pen or telephone not working. In 115 out of 145 cases, the cause of frustration was a person rather than an object. These instances of frustration led to 113 aggressive actions: verbal retorts, insults, physical attack on the person (pinching, hitting, pushing) or on the object (breakage).

B) *Retreat and evasion.* In this research Gates observed that in some cases the subject reacts to frustration by flight (leaving the room, for example), with implicit aggressiveness, or the subject withdraws into a mental void or morose gratification. We speak then of fixation. A rat which does not find the solution in a Lashley jumping-stand hangs on to the platform and cannot be dislodged.

C) *Regression.* This classical effect of frustration clearly demonstrates we have said about the nature of emotion. An easy task is substituted for a difficult one. This conduct will be analysed in detail in the following section.

Obviously, frustration does not produce emotional disturbance unless a strong drive is obstructed. It is difficult to take the feeding-bottle away from a baby who has just begun to drink, and he reacts by anger; towards the end of the feed it is possible to withdraw it without precipitating this reaction.

The behaviour of young children also shows that the obstacle to need-satisfaction depends on the significance ascribed to it by the subject. A three-month-old child cries whilst his bottle is being prepared because he cannot tolerate the period of waiting; several months later he may laugh instead, anticipating future satisfaction.

(D) EXCESS OF MOTIVATION IN CONFLICT

The distinction between frustration and conflict is delicate, but it is usually conceded that conflict exists when someone finds himself faced by two simultaneous and incompatible incitements to act. Conflicts are one of the principal sources of emotion and it has been seen already that psychologists such as Dewey and Claparède regarded conflict as the most typical source of emotion. Obviously conflict increases motivation in the same way as frustration. A good example is provided by Rey's experiment (1936): a guinea-pig had been taught to jump from one compartment of a cage to the other, both floors of which could be electrified. A bell rang five seconds before the shock, a conditioned sign to jump. If a carrot was placed in one compartment at the same time as the bell rang, there was obviously conflict for the animal, as shown by the fact that he ate the carrot very quickly and greedily before jumping. The 'eating' motivation had been increased.

All conflict does not produce emotional responses. Conflicts are principally a source of emotion when the subject cannot find a solution easily. To return to Lewin's useful classification (1935), used by Miller (1944) and Brown (1948), there is approach-approach conflict, approach-avoidance conflict and avoidance-avoidance conflict. The first is never dramatic, even if the choice is difficult and is preceded by a period of hesitation. Approach-avoidance conflict is the most delicate. Sometimes it can be solved, sometimes not. For example, if a rat is taught to press a pedal in a Skinner box (Estes and Skinner, 1941) to obtain food and it receives an electric shock from the pedal after a warning bell, there is an approach-avoidance conflict; after shock, the rat may be observed to press more slowly on the pedal in proportion to the frequency of this situation or it may even cease this natural activity. Its behaviour shows anxiety as a result of conflict. This type of situation is also allied to what Pavlov called experimental neurosis, which is an extreme instance of emotion. In Pavlov's first experiment a dog was taught to respond positively to a circle and negatively to an oval; if the oval is then made progressively more circular, there comes a moment when discrimination is no longer possible. The animal then shows signs of a strong generalized motor excitement of considerable duration, trying to bite and tear the apparatus.

Avoidance-avoidance conflict is even more dramatic because there is never a good way out. The individual is between Scylla and Charybdis. The child is often placed in this situation by the teacher who threatens him with punishment if he refuses to do something he dislikes (eat his soup, do his homework, etc.). These conflicts produce the same type of reactions as frustration; physical or imaginative evasion, aggressiveness, regression, inhibition, all emotional disorganization of behaviour.

3 Conditioned emotion

The existing situation was sufficient reason for the emotion in all cases considered up till now, but there are cases where emotion can be explained as the result of conditioning, where neutral stimulus has acquired emotive power by its association with an upsetting situation. Wallon (1949, p. 70) quotes from Féré the case of someone who learnt of her daughter's death while eating; she began to vomit and afterwards felt sick every time she was faced with the same food.

However, Watson and Rayner's experiments on a child of 11 months (1920) are even more enlightening. At the beginning of the experiments the child had no fear of a white rat. Later, every time he touched the rat there was a loud noise to frighten the child and make him cry. Afterwards the mere sight of the rat made the child cry and try to run away through fear. Fear of the rat had been conditioned and, following the laws of conditioning, fear became generalized to other furry animals or anything that felt the same, although before the experiment it had been verified that these stimuli were neutral. Jones (1924) obtained the same results and also showed that these reactions could be extinguished by fairly complex processes (presenting the feared object together with another coveted object, or using social imitation).

I have also observed a four-year-old child at a time when she was afraid of dogs. Living with other children who played with a poodle, she gradually became used to stroking and playing with it. This illustrates how fear can be extinguished and how this extinction becomes generalized. On a country walk the child showed no fear of the gamekeeper's or shepherd's dogs and approached them without fear.

Not merely motor, verbal responses—that is, visible responses—can be conditioned, but also neuro-vegetative reactions which are either observable in man or, more generally, subconscious. For instance, vaso-constriction can be conditioned to the sound of a bell, a movement, a light or the pronunciation of a syllable (Menzies, 1937). Bykov (1956) showed that these neuro-vegetative responses can be conditioned to interoceptive stimuli, which extends the field of possible conditioning considerably.

This conditioning doubtless explains many of the very widespread emotional reactions produced by anxiety which we observe in ourselves without being able to find their usual antecedents. Stimuli which are neutral in character have acquired a strength through conditioning, without our noticing.

4 *Emotion through contagion*

There are cases where no particular situation predisposes us to emotion, except that one or two people around us are registering emotion. Fear, like joy, is contagious. There is a fairly close correlation (0·67) between the number of cases of fear cited by mothers and those of the children (Hagman, 1932). This contagion may even be generalized to a whole group and panic occurs not only in the animal kingdom, but also among human beings.

Many explanations have been sought for this contagion, but they are mostly verbal, such as sympathy or antipathy. It seems that a distinction should be made between two types of contagion, one corresponding to cases where a situation produces in one and then in several people the same response of fear, anger or joy. These situations are similar to the preceding ones except that the existence of the group brings with it heightening of the emotional state and responses.

The other type is more specific and corresponds to cases where an emotion seizes us even though the situation does not concern us directly. If we see two men quarrelling violently, we could be indifferent or interested, but we might even become angry ourselves. In this case, as Young remarked (1943, p. 332) we identify ourselves with one of the protagonists. In the same way, laughter may be contagious. We can laugh because someone near us is laughing, but only if we identify ourselves with this person. Otherwise we remain indifferent or even become annoyed.

Anything which facilitates identification increases emotional contagion. On the one hand, contagion is proportionally more frequent and intense when emotional feelings are externalized. On the other hand, anything which decreases the social distance between two or more beings facilitates contagion, as is the case with love or physical proximity.

Wallon (1949, pp. 76–7) thought that the distinction between the self and others is acquired only progressively. Emotion recalls us to earlier phases of being together. 'Emotions explode with greatest facility and intensity among crowds of people, when everyone's sense of individuality is effaced.' Societies which recognize the value of these collective manifestations attach great importance to ceremonies, rites and games which reinforce their cohesion through the unity of identical emotional behaviour.

5 *Chronic emotions: 'Stress'*

There are transient origins of emotion as well as chronic ones. If the stimulation which usually produces an emotional response recurs and the situation is such that there is no adaptation which will remove the source of the emotion, anxiety or even neuroses may develop.

From 1927 onwards Liddell carried out very intensive studies on sheep and goats. The sheep does not seem a particularly sensitive animal, yet Liddell (1956) provoked anxiety states and even neuroses simply by a regular repetition of defensive conditioning. The animal is harnessed[1] and an electrode fixed to its foreleg. After a 10-second signal it receives a medium-strength electric shock. Normally the animal reacts to the sound by crooking its leg, which does not, however, prevent the shock. If this sequence is repeated every five minutes, the animal starts by being calm between stimuli, the breathing is regular and the pulse normal, but as a general rule, the neurosis suddenly appears and agitation becomes widespread, movements generalized, the breathing irregular and the pulse increased. This state is not limited to the duration of the laboratory sessions, but the animal is hyper-active day and night. If someone even approaches the flock, it runs away; at night, it starts at the slightest sound and does not stop moving. If the rhythm of the shocks is changed, the symptoms are modified. With 2-minute intervals, the animal shows phenomena of rigidity with slowing of pulse-rate, that is, the opposite of agitation. Instead of urinating and defecating constantly as at first, the animal keeps quite still in the laboratory. Liddell points out that these phenomena for the 2-minute interval as well as for the 5-minute one do not occur if the shock is not preceded by a signal. Anthropomorphically, we would say that repetition of anxiety at a certain frequency is the source of the neurosis.

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[1] The experiment gives comparable results if the animal is at liberty in the laboratory.

This experiment can help us to understand many kinds of human behaviour. In many lives there are more or less permanent causes of heightened motivation. The source often has a social origin: a woman who fears, rightly or wrongly, that her husband is deceiving her, a workman who lives in a state of insecurity and fears dismissal, a soldier who is afraid of being killed; these repeated fears, which are not expressed in one's normal activities, create a more or less acute state of anxiety.

This state may also spring from an unsolved internal conflict, for example, from repression of a sex impulse. The revival of the urge may bring the conflict to light again.

All these unsolved personal or social conflicts constitute what Selye (1946–56) calls stress.[1]

These tensions produce more or less widespread anxiety states and, if more intense, neurotic states. The consequences are to be found not only on the psychic plane, but by their very reiteration may produce organic lesions by sympathetic irritation and thus require a psychosomatic approach in medicine. This will be studied in Part 3.

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[1] It has become a habit to call any moving situation *stress*, but this term should be reserved for repetitive or chronic situations in which adaptation disorders can become evident.

3 Emotional responses

1 *The source of emotional responses*

Everything appeared quite simple to Watson (1919). Man was born equipped with emotional responses whose development followed the classical laws of conditioning. According to him, there were three kinds of primary reactions which he called fear, anger and love, while specifying that he could have called them X, Y and Z.

Fear produced in an infant by violent noise or loss of support is characterized by the startle response, a withholding of breath, clenching of the hand and pursing of the lips, later by crying.

Anger caused by obstruction of bodily movements is expressed by stiffening of the body, agitation of the hands, arms and legs, opening of the mouth and slight facial cyanosis.

Love produced by rocking and touching the skin of the erogenous zones is shown by chuckling or cooing and later by laughter.

Later research, however, has not confirmed Watson's descriptions. The reactions of the young child are not as clearly differentiated. To demonstrate this, Sherman (1927 and 1928) filmed the emotions of babies a few days old in four different situations: the child was dropped a short distance, pricked with a pin, its head was held so it could not move and finally when it was hungry. These films were presented to observers—nurses, doctors and students—in four different ways:

(1) Complete presentation of films: the observers see the situation and the response;
(2) Presentation of emotional reactions only;
(3) Presentation of emotional reactions preceded by incorrect stimuli, and, finally
(4) Actual presentation of children who are stimulated behind a screen which is then rapidly withdrawn.

In each case the observers had to name the child's emotion. In the first situation, there was fairly general agreement between observers, who interpreted the response in the light of their knowledge of the stimulus. The result is confirmed by the fact that in situations 2 and 4 the observers' comments differ very little; they usually recorded anger. The crucial experiment is the third situation where the observers are seen to interpret the reactions according to the so-called stimuli, as in the first situation. So the response to obstruction of movement is interpreted as a fear reaction if it was preceded by a fall.

All psychologists agree today that the child's early responses are not differentiated. Sherman had already come to this conclusion. Apart from certain specific segmental reflexes, the child's reactions are unco-ordinated and unclassifiable. They illustrate perfectly what we have said about the nature of emotions. Diffuse excitement is shown by agitation, whether the child is hungry, impeded in his movements or soiled. If the excitement becomes too strong or lasts too long, this agitation becomes spasmodic: the child cries or screams.

Bridges (1930) outlined the genetic development of the emotions by a process of progressive differentiation. The first form of emotion is excitement which towards three months of age divides into reactions of distress and pleasure. His schema, in reality, integrates both attitudes and emotions.

Stoffels' experiments (1940–41) clearly illustrate this lack of differentiation of responses in infants of less than ten days. The principal results are as follows:

1. Excitement multiplies the spontaneous movements which remain of the same kind. Observations of 30 infants showed 75 movements of both legs for 15-second non-stimulation periods, and 378 movements while the child's head was held for 15 seconds.
2. The reactions are the same whether they are spontaneous or in response to excitation. The correlation is $r = 0{\cdot}85$.
3. The distributions of frequency of the different segmenti reactions are very similar. Thus, the correlation between movements induced by immobilizing the head and by hunger excitement is $r = 0{\cdot}82$, and with reactions to cold produced by contact with metallic scales, $r = 0{\cdot}72$.

The results obtained by another of Fauville's followers, Lin-Chuan-Ting (1949), were slightly different. Working with 556 newborn babies, he showed that reactions to hunger and satiety are not the same. He observed the frequency of 54 partial movements in five areas of the body: head, arms and hands, legs and feet, general movements of the trunk, miscellaneous reactions (cries, sighs, yawns).

Whereas the reactions to hunger seem a simple exaggeration of spontaneous movements, the reaction to satiety appears distinct and is chiefly characterized by very free movements. This reaction is also found among infants after a bath.

Wallon (1949), using further clinical observations, had already noted that agreeable sensations give rise to a wave of tonicity which is drained off effortlessly as soon as it reaches a certain level, whereas disagreeable sensations, especially strong ones, produce more tonicity than the organism can deal with in immediate reactions: spasms then appear—stiffening, clenching, cries, sobs, spasms.

From birth, two fundamental reactions appear, brought on by agreeable and disagreeable experiences. Painful situations particularly reach a certain intensity, especially at this age, and become sources of emotional responses which remain, as such, undifferentiated.

Absence of relationship to the cause of the emotion corresponds to this lack of differentiation.

Studies of infants are confirmed by those on animals brought up in restrictive cages in which they are deprived of all environmental experience except that of food. Hebb (1949, p. 266) raised chimpanzees in isolation. When they were placed in more natural surroundings, their first response was one of general agitation, and differentiated reactions appeared only gradually.

Melzack (1954) bred eight Scotch terriers in cages where they were deprived of sensory experience. He also set up a control group of eight other dogs of the same breed raised in private homes or in the laboratory where they were given all possible care. The animals were then mixed and tested in similar conditions. The experimenter then passed before them a man's head made of wax, a bear's skull, a toy car, an umbrella suddenly opened, a balloon being blown up, a live rabbit, etc. The behaviour observed was classified into three categories: excitement, flight and aggression. During the first months the dogs brought up in cages showed diffuse excitement reactions, whereas the chief response of dogs brought up normally was flight. After one year, the cage-reared dogs still had bouts of excitement but also as many flight responses as the others. However the dogs brought up normally showed aggressive responses in addition.

These experiments show that undifferentiated excitement is the primitive form of emotional response, and also that differentiation of the emotions and their polarization in relation to their cause, whether flight or anger, are not due solely to maturation.

In the infant of three to six months, reactions of anger and fear appear, one differentiated form of this being dislike. Laughter is also evident among the reactions of satisfaction. Jealousy, combining anger and fear, appears between 12 and 18 months. Afterwards, between two and five years, disappointment and envy are added to anger, and anxiety and shame to fear (Bridges, 1930; Malrieu, 1952 and 1960).

2 *Deterioration of action. Regression*

As we have seen, the first effect of emotion is to cause the performance level to drop and to set in motion a series of somatic changes which affect the working of the body and the organism's social life.

We will return to these classical symptoms, but first we must emphasize that emotion affects all our adaptative functions. Our motor responses become less controlled, our attention becomes fleeting, and as the saying goes, 'we lose the thread of our thoughts', we have lapses of memory, make mistakes, etc.

It is impossible to draw up a list of these lapses. They relate to every form of activity. It is, however, possible to regard them often as regressions, that is, as responses at a lower or earlier level. Sanders's experiment (1937) illustrates this phenomenon. In a simple maze (Fig. 5) the reinforcement point (F) where the food is to be found is beyond a compartment where the animal can be shut in G_1—G_2. In the preliminary trials this compartment is not used and the animal is free to choose whether to take the right- or left-hand path in the maze. Each animal shows a preference for one or the other. Then, in the first experimental stage, the preferred side is reinforced by delaying the animal in the closed compartment only 5 seconds after this choice, whereas it is kept 90 seconds if it chooses the other side. In the second stage, the rats have to make the opposite decision, that is to say, they are kept in the compartment only 5 seconds after choosing the non-preferred side as against 90 seconds for the preferred. When this new learning has taken place, the animal is given electric shock as it leaves A, or it hears a loud noise when it reaches choice-point B.

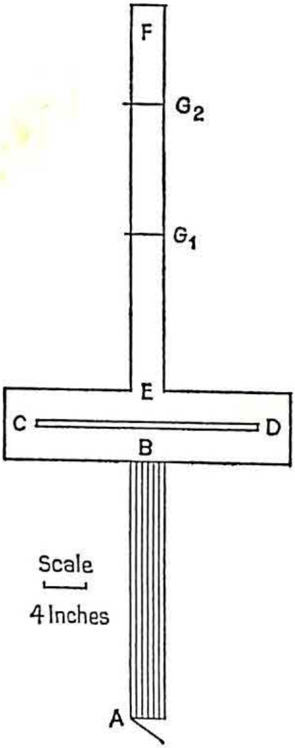

Fig. 5. Diagram showing floor plan of apparatus used. (From an experimental demonstration of regression in the rat by M. J. Sanders, *J. Exp. Psychol.*, 1937, **21**, 495.)

Regression is then observed, the animal returns to the first solution, 'forgetting' the second which is the right choice since the delay time has not been altered.

When studying the Yerkes-Dodson law (p. 115) several examples of deterioration or regression were seen.

As far as learning is concerned, the stereotyped character of poor responses is often observed, as if fear had the effect of freezing the concomitant responses (Schaffer, 1954).

3 *Specific emotional reactions*

Emotions produce a characteristic series of reactions in the organism.

Obviously, all reactions of the organism do not correspond to emotion; effort, fatigue, sexual excitement and illness produce their own reactions, some of which may also be found in emotion. It is the situation alone which makes, for example, an increase in the heart rate or blood sugar significant.

This being agreed, there are, however, reactions which are more characteristic of emotional behaviour. Let us look at the list of 'sensations' felt by American pilots during aerial combat, for example (Shaffer, 1947). This list has been drawn up from replies to a questionnaire. It gives the percentage of cases in which each reaction was felt.

	per cent
Palpitations of the heart	86
Muscular tension	83
Irritability	80
Dryness of mouth and throat	80
Cold sweat	79
Stomach contractions	76
Feeling of unreality	69
Frequent desire to urinate	65
Trembling	64
Sense of confusion	53
Feeling of weakness	41
Forgetting details after mission	39
Feeling sick	38
Inability to concentrate	35
etc.	

It would be interesting to draw up similar lists of reactions to other situations. Judging from the above list, they can be divided into three categories:

(A) Neuro-vegetative reactions
(B) Muscular reactions
(C) Reactions of sensation

We will add a fourth category to this scheme for the study of emotional responses: expressive reactions which the pilots could not describe, as it involves self-assessment.

4 Neuro-vegetative reactions

For many people emotions are first characterized as disorders of the neuro-vegetative functions. It is true that they are partially integral. The list of neuro-vegetative disturbances to be found in one or another emotion is long: skin conduction (PGR), heart rate, blood pressure, vaso-constriction and vaso-dilation, rate, depth and regularity of breathing, skin temperature, sudation, pupillary diameter, salivary secretion, digestive action, contraction or relaxation of the sphincters, electrical cerebral activity, chemical and hormonal analysis of the blood, urine and saliva and basic metabolism are all more or less modified.

Every year this list grows longer as progress in physiology and biochemistry enables new measures of vegetative functioning to be made with ease and precision. It might be useful to repeat that few neuro-vegetative changes can be considered solely as characteristics of emotion. All activity modifies the level of skin resistance, heart rate, blood pressure, respiration rate, EEG characteristics, etc. For example, fear and running a race both increase the heart rate; apprehension and mental arithmetic both cause the appearance of atypical cycles in respiration. Considered only as indices of activity, we will never find an emotion which can be defined only in relation to a situation. To take only one example, in a group of 17 students an average increase of 25 heart-beats per minute and an increase in blood pressure of 15 mm. were observed before an examination (Brown and von Gelder, 1938). Was this normal activity or had it exceeded the limit at which one may say an emotional response appeared? An answer cannot be made on the basis of these statistics alone.

However, the very excess of certain activities brings on real disorders. Homoeostatic controls are thrown off balance. Relaxation of the sphincter, fainting and vomiting are extreme cases; but without going as far as that, all of us have felt or observed disturbances which cannot be explained by activity alone; dry mouth, sweating hands, blushing or growing pale, not to mention the biochemical changes which elude direct observation.

The central problem is the role played by the sympathetic and parasympathetic systems respectively in neuro-vegetative behaviour.

All the neuro-vegetative functions depend directly on both

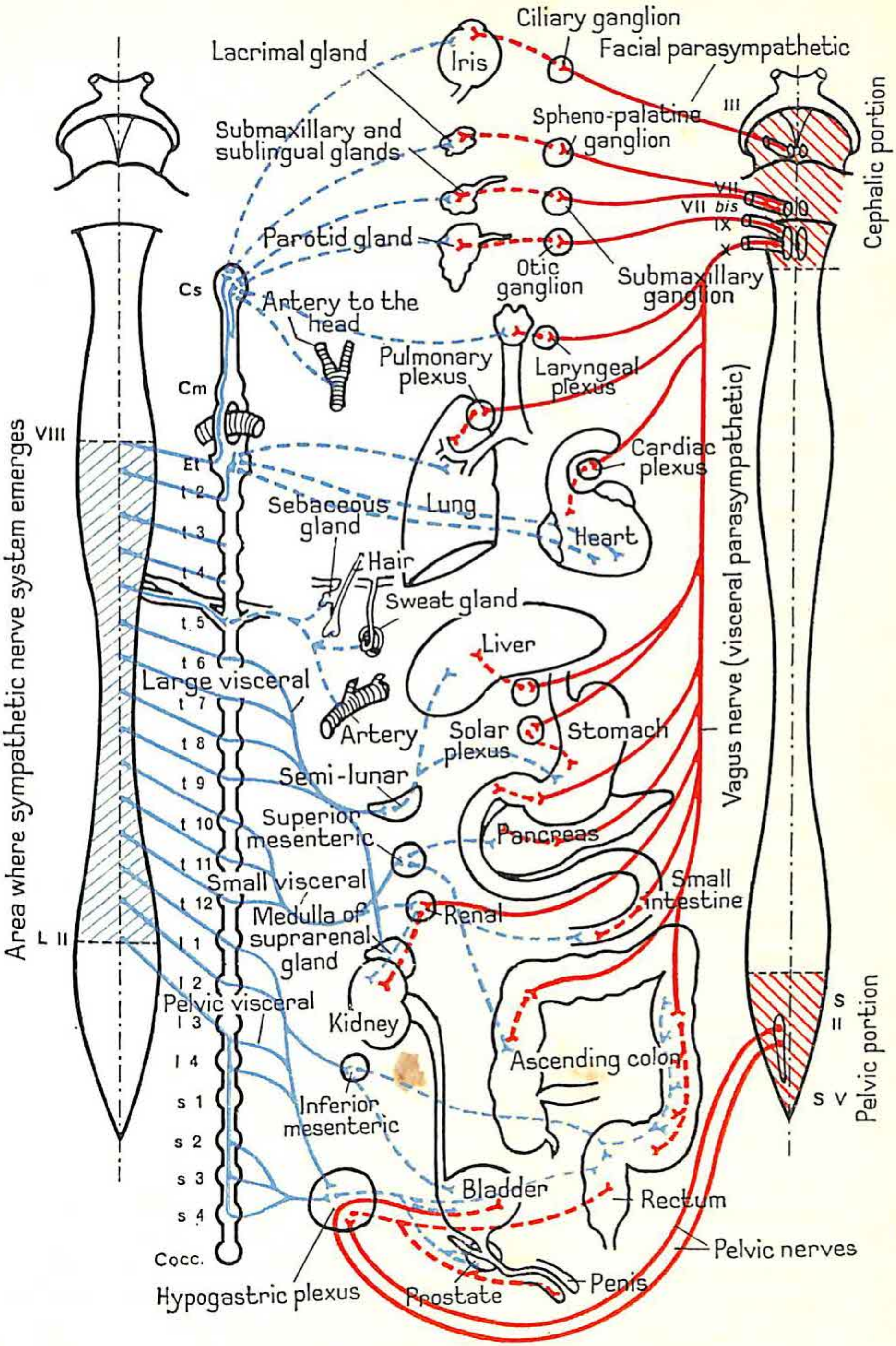

Fig. 6. Arrangement of main centrifugal ducts of the orthosympathetic (left, dotted) and parasympathetic (right, dashed) nervous systems.

The preganglionic fibres are shown by a solid line and the postganglionic fibres by a dotted line. (From *Morphologie et physiologie animales* by G. Bresse, new revised and enlarged edition, Paris, Larousse, 1953, p. 416 bis.)

systems and the automatic system as a whole is inter-connected with the cerebro-spinal nervous system at all levels of activity, and particularly with the hypothalamus which controls and co-ordinates the vegetative functions as a whole.

The *autonomy* of the sympathetic and parasympathetic systems is relative. Besides, these two systems do not play the same role in the organism. The first mainly activates or is catabolic, controlling the creation of energy, whereas the parasympathetic or anabolic is mainly responsible for preserving energy.

These two systems are frequently antagonistic. The excitation of the sympathetic accelerates the heart, dilates the pupils, produces vaso-dilation of the surface ducts and vaso-constriction of visceral ducts, the secretion of the sweat-glands and the adrenal glands, the inhibition of the salivary glands, orgasm, etc. Excitation of the parasympathetic slows down the heart, produces constriction of surface ducts and the dilation of visceral ducts, salivary secretion, the discharge of insulin, erection of the genital organs, etc. (Fig. 6).

Our equilibrium, 'the wisdom of our body' as Cannon called it (1946), depends on the balancing of these two systems. Obviously a lack of balance occurs during emotion. From 1911 Cannon's works directed research and discussion towards this problem. He believed, in effect, that the neuro-vegetative disorders in emotion were mainly due to excitation of the sympathetic nervous system which is itself increased by one of its own functions: the discharge into the blood of adrenaline from the glands of the renal cortex. This effect is even more systematic in view of the fact that the parasympathetic has no inhibitory power over this secretion.

The increase in the level of adrenaline in the blood has an excitatory effect on the sympathetic ganglions, accelerating the heart and the glycogenic function of the liver particularly. However, it should be remembered that this acceleration of the sympathetic system by the action of adrenaline is relatively slow. Adrenalaemia can be found in the blood after 16 seconds, hyperglycaemia after 5 minutes. The effect of adrenaline was proved by Cannon's experiments—the blood of a cat excited at seeing a dog, injected into another animal, brought about neuro-vegetative reactions which are not produced by injection of blood from an unexcited animal.

Cannon did not claim that adrenaline is indispensable to emotional response. It merely reinforces the action of the nervous system. Heart rate increases in a cat excited at seeing a dog; it still increases, but in lesser proportion, if the adrenal glands have been removed first (Fig. 7).

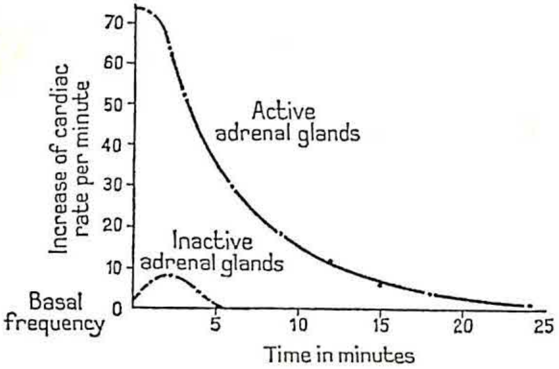

Fig. 7. Long duration of cardiac acceleration when the adrenal glands are active and the animal (a cat) had been excited for one minute by a dog's barking; slight cardiac acceleration and relatively rapid return to calm state when adrenal glands are inhibited although the cat had been excited for a period twice as long as in the first study.

In both cases the animal was quickly taken out of the cage after excitation and placed on a cushion to rest by until it returned to a normal state. (From la Sagesse du Corps by W. B. Cannon, trans., Z. M. Baeg, Paris, Nouvelle Revue Critique, 1946, p. 206.)

On the basis of these findings Cannon formulated the view that emotion served a valuable function, namely that it alerted the organism. We have seen an explanation of this (see p. 116). Violent controversy arose as to whether the parasympathetic system had also been excited during emotion. Cannon did not deny this possibility, but he remarked, drawing on physiological facts, that the sympathetic system plays a more important role because it functions in a total manner. Its action, he says, is comparable to that of a piano pedal, while the parasympathetic system acts in only an isolated way, as when single keys are struck.

The understanding of emotional responses is no doubt very complex and its mechanisms are not yet properly known. For example, is acceleration of the heart during emotion due to excitation of the sympathetic nervous system or inhibition of the moderating action of the vagus? According to Whitehorn (1935), the second explanation would seem the more likely because there is so little delay in the occurrence of increased heart rate that it appears to be due to the rapid action of a nerve rather than the slower action of the sympathetic system. Gellhorn (1943) also demonstrated that after ablation of the sympathetico-adrenal system, electrical excitation of the left dug of a dog produced anger with hypoglycaemia. According to Gellhorn there is in fact excitation of both systems with, usually, predominance of the sympathetic system.

This hypothesis would explain the facts better. Dumas (1932), using many examples from pathology, had already emphasized the fact that emotional reactions more often correspond in reality to the excitatory action of the sympathetic system but sometimes also to the inhibitory action of the parasympathetic (dry mouth phenomenon). Furthermore, he stressed as an example of the positive action of the parasympathetic system the relaxation during emotion of the sphincter which is innervated by this system.

However, certain authors, such as Morgan (1949), think that the action of the parasympathetic is particularly connected with agreeable activities—nutrition, evacuation, erection. These reactions, which give pleasure, do not appear in disturbances of adaptation.

5 *Tension and muscular spasms*

A man who has received an emotional shock is 'strained', by which we mean that his muscles are in a hypertonic state.

Wallon (1949), who has frequently been quoted here, constructed his theory of emotion around this fact. On the one side he put social life where sensations control behaviour, and on the other, the affective life where stimuli are transformed into the tonic, visceral and muscular activity of the whole organism. Indeed, Wallon's originality lay in demonstrating the importance of postural tonus in emotion.

Emotion begins with hypertonicity and is shown externally when this energy, instead of being effectively utilized, explodes in spasms (laughter, tears and angry movements).

A moderate tonic state is a normal and useful prelude to all action, and in this case is localized. In emotion, on the contrary, it is diffuse, generalized and can only obstruct anticipated movement. It finally ends in trembling or in badly co-ordinated movements.

The regulation of tonus is very complex, and depends on the autonomic system in a manner as yet unknown; discharge of adrenalin in particular delays excitation of the muscular fibres. Important controls work: (a) through the reticular formation and the centres of the brain stem which co-ordinate the proprioceptive messages from the head and vestibule of the inner ear, these centres having a mainly excitory effect; (b) through the extrapyramidal system composed of the basal nuclei, the premotor area in the frontal lobe and the sensorimotor areas of the parietal lobe, this system having a mainly inhibitory effect.

All the layers of the nervous system play a role, but the importance of the feed-back phenomena must be emphasized because the proprioceptive messages, which are partially linked to muscular tonus, act in their turn on the reticular formation. Unfortunately, it is almost easier to note tension clinically than to measure it (Davis, 1942). It can in fact be localized or diffuse (tension of the neck muscles plays an important role in man).

Tonus of the hand can be measured by the strength with which an instrument is gripped or by the pressure on an object. The tonicity of a group of arm muscles, or forearm muscles, may be roughly estimated by its volume. The method usually used now consists in discovering the electrical potentials of the muscles (electromyography or EMG), but this technique does not permit separation of activity which is really tonic from the clonic activity involved in movement, especially if one uses recording devices to quantify the electrical activity of the muscle. The state of tension may be assessed indirectly by the intensity of a reflex response. In medical practice, this is the usual technique. Jacobson (1927) showed that if subjects are asked to tense themselves the response provoked by a sudden stimulus was more intense the more tension there was. The violence of anger responses springs from the same source. Muscular tonus depends on the level of arousal which is at its lowest during sleep and increases with awakening and activity. If tonus is recorded by means of electrodes placed on the forehead, it will be observed that it increases when the subject merely listens to a detective story lasting ten minutes (Wallerstein, 1954). The mere idea of movement produces an increase of electrical activity of the muscle in the corresponding region (Jacobson, 1932 and 1951). During extreme excitement one may observe considerable tension when the individual inhibits gestures which would set in motion immediate consequences if moral or social constraints did not intervene. The boy who does not dare take a girl into his arms; the child who would like to reply with a remark or a show of fists; someone who is afraid but dares not run away, all show signs of strain.

This tension resulting from inhibition of actions is difficult to demonstrate. Smith's research (1953) throws light on this problem in a situation which is not, however, intense. He measures the EMG activity of an arm engaged in drawing on a mirror, which requires a constant but slight sensori-motor conflict. He sets up two equivalent groups of subjects, one of which is allowed to finish the task and the other is stopped before the end (at 84 per cent). The electrical activity, in arbitrary units, is as follows:

EMG Activity	*At beginning*	*At half-way*	*At 84 per cent*	*After*
Group finishing task	89·9	161	172	98·9
Interrupted group	90·3	167	173	125·7

It therefore appears that the EMG activity of the two groups was the same until one group was interrupted, but after finishing the test the remaining tension was greater among those whose activity had been obstructed. Sociologists have observed that children brought up more severely had postures showing greater tension than those brought up more freely.

Generally people suffering from conflict or even neuroses are more tense than others. Psycho-analysts have observed that their patients were more strained and tense at the moments when they relived their major conflicts. Malmo and his fellow-workers (1951) found that mentally-ill patients were more tense than a control group of normal subjects. The mentally ill were divided into three groups: (a) those suffering from psycho-neuroses with predominating anxiety states; (b) those with acute psychoses showing schizophrenic or paranoid symptoms; (c) chronic schizophrenics; none of these patients were in hospital. The experiment is as follows: the subject, eyes closed and his head held in place by a chinstrap, has strong heat applied to his forehead for 30 seconds. His hand rests on a button which he can press if the stimulation becomes too painful. Electrodes are placed on the corresponding forearm and the EMG is registered at 10-second intervals. Thirty seconds after each stimulus the subject is asked to give his impressions. There is a 90-second interval between stimuli. Figure 8 shows the results: BS (before stimulation) S (at the time of painful stimulation) BQ (before questioning) and Q (during questioning). The results are very clear: even before stimulation, the mentally-ill are more tense than the normal subjects in the control group.

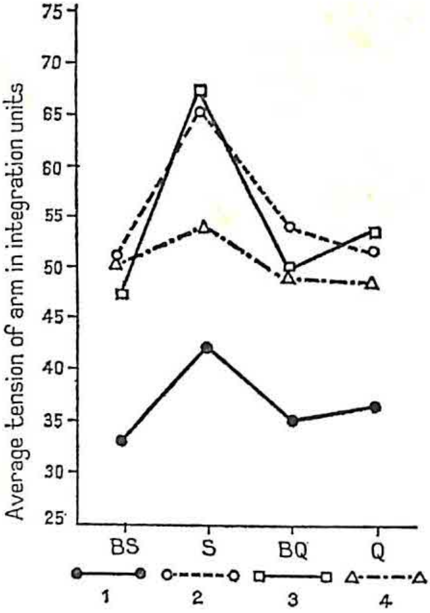

Fig. 8. Average tension of arm during different stages of pain test with 4 groups of subjects.

(1) Control group; (2) Psycho-neurotics; (3) Acute psychosis group; (4) Chronic schizophrenic group.
BS, before stimulation; S, during stimulation; BQ, before questioning; Q, during questioning. (From Electromyographic studies of muscular tension in psychiatric patients under stress, by R. B. Malmo, C. Shagass and J. F. Davis, *J. clin. exp. Psychopath.*, 1951, 12.)

This technique is used in psychotherapy. Jacobson's method of progressive relaxation (1928) and Schultz's autogenic training

(1958), for example, consist in teaching the subject how to relax which lessens excitability, anxiety and allied disorders.

Lobotomy also has the effect of decreasing muscular tension in patients by destroying the infra-cortical connexions to the frontal lobes and also their influence on the motor areas.

In less extreme situations it is also possible to see excessive tonic activity manifested in trembling or incomplete gestures.

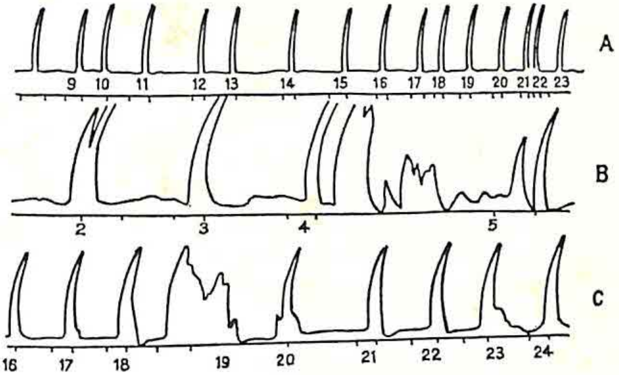

Fig. 9. Motor reactions accompanying verbal responses by students awaiting selection.

A, control subject; B and C, students. (From *The Nature of human conflicts*, by A. R. Luria, New York, Liveright Publishers, 1932, p. 50.)

If subjects are asked to recall situations which have made them angry, a notable increase in trembling may be observed in 85 per cent of cases, measured by means of a tremometer, and the remaining 15 per cent admit that they were unable to make the required recollection (Edwards, 1949).

Luria (1932) devised a technique for examining motor confusion in conflict. The subject is seated comfortably, his fingers attached to a pneumatic tube in such a way that his slightest movement is transmitted to a recording instrument. The test is free word association, the subject having to press the tube each time he replies. The anticipatory movements, complicated gestures and subsequent movements are indications of motor disturbance, perhaps slight, but symptomatic. Figure 9 shows the results of three subjects: A, subject in normal situation, B and C subjects who did the experiment while waiting to appear before an examining board for admission to a school. Not only are motor responses disturbed, but between stimuli the lines register trembling and agitation.

This is shown even more clearly in Fig. 10 concerning only

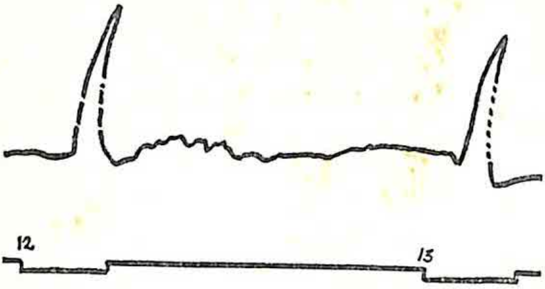

Fig. 10. Motor symptoms of perseveration of excitation (after A. R. Luria, op. cit., p. 223.)

the effect after presentation, in a word association series, of a word in a foreign language which the subject knew.

6 *Neuro-vegetative and motor reactions*

An emotional shock produces reactions in the autonomic system as well as in the smooth and striate musculatures. However, these reactions are not produced at the same speed. According to Davis, Buchwald and Frankmann (1955), the sequence of some reactions of inactive subjects to a loud, brief noise is the following (the times indicate the period before maximum change is observed).

Muscular tension (EMG) of arm)	0·2	—0·3	sec
EDG (electrodermogram) left hand	4	—	,,
Vaso-constriction (left index finger)	5	—10	,,
Increase of pulse rate	5	—10	,,
Increase of blood pressure	5	—10	,,
Respiration (maximum amplitude)	15	—20	,,

All these reactions may simply indicate the presence of an excitation which precedes or accompanies adapted responses which depend on the limbs. One or other of them may also be conditioned, but it may be observed that conditioning of the neuro-vegetative reactions is more rapid and stable than that of adapted movements. For instance, cardiac acceleration in the case of a nociceptive stimulus is more rapidly conditioned than the avoidance response (from Schaffer, 1954). Anderson and Parmenter (1941) set up delayed conditioning in a sheep with a period of 10 seconds between the signal and the shock, then they changed the interval to 20 seconds. Although the new motor conditioning had been established, cardiac reactions still occurred after 10 seconds, as if there were two different levels of conditioning. The development of reactions from one system to another is, moreover, standard. Wallon (1949, p. 51) put great emphasis on Insabato's observations about the child who is tickled. An increase in tension produces spasms which emerge in the form of laughter, but if excitement continues, laughter gives way to tears. In this situation laughter corresponds to a weaker excitation than fear or tears. Facts confirming this have been found also in genetic development. For example, a comic scene in a film may create reactions of fear or anxiety in young children, whereas older children laugh outright (Leroy-Boussion, 1955).

This possible vicariousness of reactions leads us to emphasize the fact that there may be a certain balance between the neuro-vegetative and muscular reactions. Anger which is suppressed produces stronger visceral reactions than an explosion of the whole organism. During fear, flight reduces neuro-vegetative changes. During the 1914–18 war Derrien and Piéron (1923) observed that fear and pain in connexion with lumbar punctures increase the level of glucose in the blood and cerebro-spinal fluid. However, they also observed that there was less increase among soldiers who gave vent to their emotions in agitation and cries than among those who inhibited their motor reactions and tried to hide their feelings. Landis (1932) also found that electro-dermographic reactions or EDG[1] were less marked in those children carrying out a difficult task (with a pursuitmeter) who expressed their difficulties and emotions more openly.

Several studies were made of this problem by Jones (1950). He found that it was difficult (but not impossible) to obtain EDG reactions in children of less than one year and he interpreted this fact as being due to predominance of externalized reactions. In fact, more easily excitable children often have the least EDG. He found that in kindergarten children there is, on the whole, a correlation between EDG activity and observable emotional reactions but it is impossible to predict one kind of response from another with any individual child. He noticed several types of children: those who externalized their reactions (low EDG), those who 'internalized' (considerable EDG) and those having a 'generalized' response of the whole organism. He estimated that he had found comparable results in adolescents by comparing their EDG activity and their social behaviour.

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[1] The electro-dermographic reactions correspond to electric manifestations which are produced in the psycho-galvanic reflex (see Chapter 8).

In more minor conflict situations, such as those occurring in a mirror-drawing test, Fraisse and Bloch (1957), taking the EDG as a sign of arousal of the sympathetic system, found that it was greater before than during each of the tests, which suggested that even difficult activity decreased the amount of neuro-vegetative tension. In a similar test, Bartoshuk (1955) also found that excitation measured by the EDG tended to decrease during the task while ENG activity increased.

A study of Freeman and Pathman (1942), although different in principle, supports the same conclusion. Their subjects lie on an actographic mattress and their movements and EDG activity are measured before, during and after a pistol shot; it was observed that those who move about the most are those whose EDG reactions are briefest.

Clinical observations on excessive palmar sweating confirm these results. It occurs most frequently in adolescents and is more marked in those lacking manual skill than in the skilful. In certain people dampness of the hands disappears with activity, such as the dentist whose sweating stopped as soon as he started to operate (Parmentier-Beloux, 1953).

7 *Emotional expression*

(A) THE TRACTS AND THE CENTRES

For one person emotion is primarily the spontaneous awareness of the organism's disturbances; for another it is the expression by the organism of this disturbance particularly through facial expressions. For emotional expressions we must also repeat what we have already said about all emotional reactions. Each expression corresponds to an affective reaction and it is difficult to distinguish between adapted reactions and the expression of disturbance. There are many intermediate steps between the smile, the laugh and wild laughter, and the same is true for sad expressions and painful sobbing. In this section it will be difficult, therefore, to distinguish between emotional expression and all the expressions of the human face.

Dumas (1933) made history with this problem. Darwin (1894), studying the expression of emotions, found examples supporting his 'utilitarian' thesis—the attitude of the angry dog frightens anyone attacking it. Opening the eyes in terror allows it to see danger better and this expression has become hereditary.

Since Descartes, this teleological theory has been opposed by the mechanist theory—our emotional expressions depend on the conformation of the facial muscles and their innervation. Mosso (1888) verified this principle to a certain extent. He used electrical excitation of the dog's facial nerve and observed that when the intensity of the current is increased, the number of muscles contracting increases; a whole range of expressions is thus obtained, from attention to aggressiveness. Dumas (1933), who was very impressed by this experiment, tried to repeat it in man by exciting the facial nerve at its exit from the stylomastoid foramen. He succeeded in eliciting a smile by mild stimulation, but although intense stimulation produced exaggerated contraction of all the muscles used in expressing joy, he was unable to recognize an expression of anger as a mere exaggeration of satisfaction. Dumas recognized, without renouncing a mechanistic explanation, that human anger is more complex than animal rage, burdened as it is with acquired responses and significance. It remains true, however, that all our emotional expressions depend on the single facial nerve with its temporo-facial and cervico-facial branches which are in their turn sub-divided into a great number of terminal endings. Excitation of this nerve gives rise to the wonderful play of human expressions only because the human face is made up of a large number of muscles whose contractions correspond to a very small outlay of energy. Spencer had already noted this. Dumas introduced another principle governing the organization of these muscles, that of synergy: excitation is registered only in the muscular groups whose contractions are co-ordinated with each other.

However, the problem of the mechanism of expression is secondary to that of the centres controlling excitation.

Physiological data agree with the most useful experiments in this field in showing that in emotional expression spontaneous reactions and intentional mimicry are combined to form a real language.

The facial nerve is innervated by networks which follow different paths, one of which comes directly from the cortex, thereby putting facial expression under voluntary control, the other passes through the thalamus and basal nuclei which constitute the true centres of spontaneous emotional expression. This double system of innervation can be clearly seen in pathology where expression may be paralysed, and whilst voluntary mimicry is preserved voluntary motility may be impossible, although spontaneous expressions remain (Migliorino, 1957).

(B) SPONTANEOUS EXPRESSIONS AND ACQUIRED MIMICRY

The structure of facial innervation leads us to recognize that each expression is a spontaneous response, based on voluntary mimicry which depends on a social training.

Two kinds of research confirm this hypothesis: the first consists in comparing the emotional expressions of those blind from birth with those of sighted people. Dumas (1932) was the first to conceive this type of study and he observed that, in moving circumstances (fear, anger, joy) the blind had the same expressions as the sighted, but were less skilful in their control of expression.

Thompson (1941) verified the similarity between spontaneous expressions of the blind and the sighted by means of films: the smiles, the laughs and the cries are of the same kind, the blind having more intense reactions perhaps. When observers had to identify emotional expressions, results were equally satisfactory with both groups. Fulcher (1942) studied voluntary mimicry (assuming happy, sad, angry or frightened expressions). Photographs were taken of expressions obtained. The experiment was made on blind and sighted subjects of 5 to 20 years. Among the younger children, differences between the two groups were slight, but whereas the expression of those born blind did not develop and even deteriorated with age, that of the sighted became more pronounced and generalized.

These results show not only the dual control of mimicry, but also the fact that our expressions develop through social imitation.

This fact was confirmed by ethnological studies (Klineberg, 1957–59). The basic ways of expression emotion are universal—laughter during joy, tears during sadness, etc., but society exercises its influence in two ways.

A) It encourages the expression of certain emotions and inhibits others. There are what P. Janet called 'funeral customs'. Western civilization restricts tears almost exclusively to women, and a young boy is taught that men do not cry. However, this is not the case everywhere. Young Maoris, for example, cry easily but lose this habit after contact with Anglo-Saxon civilization. Certain expressions of joy and anger differ with different social classes, and education sets out to suppress excessive emotional display. The more social the character of the emotion, the more noticeable is this influence. For example, expression of moral anguish (mourning) is more socialized than that of anger, and the latter more than fear.

B) It creates a genuine mimetic language whose signs extend and diversify spontaneous expressions. These signs have a universal or, sometimes, very local currency, and their interpretation can be made only by someone familiar with the group being studied. Spitting, for example, is a sign of contempt in the Western world and a blessing in Arab countries. Means of showing affection may vary between one family and another and thus perplex strangers.

All these facts explain the results of May's experiment (1938, quoted by Klineberg, 1957, p. 221). Two juries, one Chinese and the other American, were asked to identify the emotional expressions of photos of Chinese and Americans. The two juries recognized many expressions in the two sets of photos; however, the Americans more easily recognized the expressions of Americans and the Chinese those of Chinese. 'In order to understand the behaviour of a race, we have to know not only their physical expression.' (Klineberg, 1957, p. 220.)

(c) IDENTIFICATION OF EXPRESSIONS

We infer from the expressions of our fellow human-beings, and particularly from their facial expressions, the nature of their emotions. These judgments obviously have very complex bases which have been increasingly submitted to experimental analysis.

Four different techniques, corresponding to different periods and aims, were used.

A) *Composite faces.* Using drawings of facial features (mouths, eyes and noses of different shapes), it is possible to reconstitute a face and study its expression. This technique was used particularly by Boring and Titchener (1923) whose material consisted of the early drawings of Piderit (1859) (Fig. 11). This German anatomist, who lived for many years in Chile, made numerous drawings to verify his utilitarian theory of expressions. He believed that the facial muscles functioned in combination with the sensory organs and served to aid or obstruct the reception of stimuli—opening or closing the mouth, the eyes, the nostrils, for example.

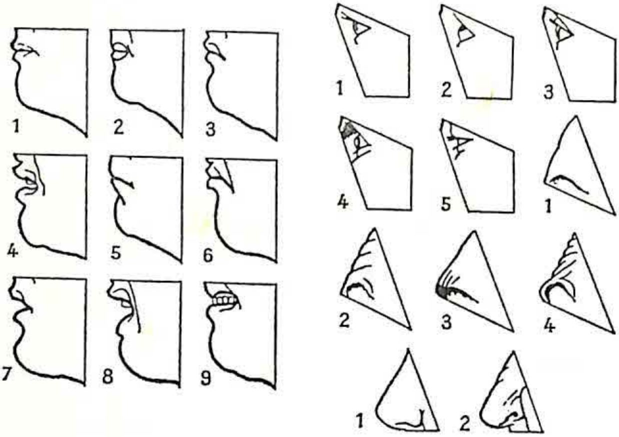

Fig. 11. Piderit's physiognomic features.

Mouths: (1) normal; (2) affable; (3) bitter; (4) very disagreeable; (5) stubborn; (6) stubborn and disagreeable; (7) attentive; (8) disagreeable and attentive; (9) surly or sneering.
Eyes: (1) normal; (2) excited; (3) attentive; (4) very attentive; (5) inattentive, sidelong glance.
Eyebrows: (1) normal; (2) attentive; (3) disagreeable or thoughtful; (4) attention directed towards something disagreeable.
Noses: (1) normal; (2) attention to something disagreeable.
(From *Experimental Psychology* by R. S. Woodworth, Vol. 1.)

Other faces were composed from photographs of the upper and lower halves of the face of one and the same person, associating the expression of the eyes in situation A with that of the mouth in situation B and, vice versa, that of the eyes in situation B with that of the mouth in situation A (Dunlap, 1927).

B) *Photographs of actors' poses.* Actors are accustomed to miming emotions and can thus furnish valuable expressive material. The first series of photos was made by Budolph (1903), an artist who had several hundreds of photographs—touched-up, however—of a very expressive actor. Since that time, several other series have been produced on the same principle: the actor takes up a pose corresponding to a certain emotion (surprise, anger, joy, etc.). The best series is without doubt that of Frois-Wittman (1930).

C) *Photographs of spontaneous expressions.* These photographs may be selected from agency photos or clips from magazines; they may also be taken in the laboratory by evoking different expressions to appropriate situations. However, experience has shown that it is easier to create some expressions, such as fear or surprise, rather than others, such as anger or joy. Darwin was the first to use this technique, which has since frequently been employed, particularly by Schulze (1906), who showed the subjects photos intended to provoke reaction; by Landis (1924); and Dunlap (1927), who used contrived but genuine situations, such as an unexpected revolver shot, the crushing of a snail between the fingers, etc.

D) *Films of spontaneous expressions.* In the preceding methods static documents were employed, whereas this method enables the use of dynamic expressions. Films may be made of scenes performed by actors, but more often they consist of recording elicited emotions, as in the Sherman experiments on babies (1927) or those of Coleman (1949). In the latter investigation, Coleman, using the same situation in each case, filmed a series of spontaneous expressions and afterwards a second series of mimed expressions, the subjects being required to assume expressions which they considered appropriate in each situation.

Woodworth (1949) studied the difficulties inherent in each of these methods; we will summarize the principal results here.

A) *Identification of the emotion:* Whatever the method of presentation, it is necessary to resort to language in order to identify the nature of the emotion. If the subject is allowed to choose his own vocabulary, an extreme multiplicity of terms used to indicate the same expression may be observed in all cases, with greater or lesser variations. To take an example from one of Feleky's investigations (1922), when describing the photo of an actress seeking to express hatred, 100 subjects used 39 different terms. The words most employed are ugliness (13 times), disgust (11), hatred (8), disdain (8), mockery (7), antipathy (5), repugnance (5), defiance (5). This simple enumeration shows the richness of the vocabulary available. In order to describe the same reaction, many more or less synonymous terms exist.

It may be observed in these experiments that the range of replies does not impede a choice being made and, in fact, the replies to the different poses correlate very little. To return to our example, none of the 100 subjects interpreted the pose presented as surprise or joy.

However, in order to reduce the disparity, subjects were asked to qualify the expressions more completely, not only by identifying the emotion but also by outlining the corresponding situation and imagining possible dialogue. From this complex identification Kanner (1931) found that of the actors' poses, surprise was recognized by 77 per cent of the subjects, fear by 70 per cent, dread by 62 per cent, shame by 53 per cent, anger by 50 per cent, suspicion by 27 per cent and pity by 19 per cent.

Another method consists in asking subjects to choose only one answer from a limited list of expressions which eliminates synonyms; this list may even be reduced to a few key-words, for example, to which the subject must relate the photos given (Schlosberg, 1941).

The intervention of language could even be eliminated by asking subjects to assemble photos corresponding to the same expression. However, this method does not give very serviceable results (see Woodworth and Schlosberg, p. 118).

B) *The role of cues:* The different techniques employed for producing facial expressions do not produce similar responses. From the results mentioned above, it is already obvious that not all expressions were as easily identified. We will now examine the means of recognizing expressions independent of this variable. Of the reconstituted faces of the Boring and Titchener type, the expressions composed by the experiments are fairly difficult to identify. However, horror was identified by 57 per cent, disgust by 48 per cent, astonishment by 34 per cent (Fernberger, 1928).

With actors' poses the percentages of recognition attained were 49 per cent for gaiety (51 per cent altogether replied happiness), 77 per cent for surprise, 66 per cent for fear, 70 per cent for suffering, 86 per cent for scorn (Feleky, 1924).

Research made on spontaneous expressions obtained in laboratory situations did not give very good results, the scope of possible expressions being rather limited. On the other hand, Munn (1940), using faces culled from magazines, obtained similar results to those obtained with actors' poses. The latter, if performed by a good actor, have without doubt an advantage over spontaneous expressions in that they are transformed into conventional mimicry whose interpretation is easier because it corresponds more closely to our social experiences.

The experimenters asked a further question: in facial expressions, which plays the dominant role, the region of the mouth or that of the eyes? Dunlap (1927) photographed the same person in laboratory situations designed to elicit laughter, surprise, suffering, etc., then he selected two photos of the same person, cut them in half horizontally and pasted together the upper portion of the face corresponding to one situation with the lower half of the face in the other. These constructed portraits were then submitted to a jury; it became clear that the composite expression depended above all on the mouth. If the mouth expresses surprise, disgust, suffering or joy, the face seems to take on the corresponding expression.

Coleman (1949) filmed subjects in several different situations and made three versions of his films: the original version, a version in which the eyes were masked, and a third in which the mouth was covered. Unlike Dunlap, Coleman concluded that recognition of the emotions was not systematically easier when given the expression of the mouth alone. The results varied according to the expression. Coleman sometimes filmed the subjects in natural poses and sometimes asked them to mime the expression which seemed to them the most appropriate to the situation. The results indicate that the role of the mouth is more important in mimed expressions; this face seems reasonable because our control of the mouth muscles is more precise and better developed than that of the eyes.

As we have seen, every expression retains at best a certain ambiguity and its identification remains uncertain. The fact brought to light by the diversity of replies is further emphasized by experiments showing that it is quite easy to suggest erroneous interpretations to subjects, whether with composed faces (Fernberger, 1928) or photos (Langfeld, 1918). The expressions of the face being always somewhat ambiguous, it is normal that everything which provides supplementary cues facilitates the identification of emotions. These cues may arise in the first place out of a knowledge of the situation. Sherman (1927) with his films of babies, and Munn (1940) with magazine photos, pointed out the influence knowledge of the situation had on the replies. In Munn's experiment, a face shown by itself produced answers varying from surprise to disgust; whereas the answers were mainly anger and hate when the whole photo was seen—that of a man holding a strike-breaker by his coat-collar.

Cues such as the general attitude of the body and, in particular, the movement of the hands or vocal expression of emotion may also bias other aspects of the reply. Hands play a very important role in the expression of emotion. Carmichael, Roberts and Wessel (1937) showed that it is possible to identify an emotion as easily by the movement of the hands alone as by the face. The sound of the voice provides comparable results. Dusenberry and Knower (1939) recorded voices reading the alphabet from A to K whilst conveying different emotions. These emotions were as easily recognized by a jury as the facial expressions.

In other words, identification of emotion is the result of a complex interpretation of all the cues provided; this is confirmed by the fact that identification is improved by learning. Explanations on how the facial muscles function and their role in the expression of emotion or even corrections improve judgments (Allport, F. H., 1924; Guilford, 1929).

Hebb, for his part, showed that in order to recognize the emotional expressions of chimpanzees it is necessary to know them very well. That is why such specialists as W. Köhler or Madame Kohts found no difficulty in interpreting these animals' expressions. Progress in identification comes with age, but in this case learning is more complex and involves the use of cues, the appreciation of their significance and progress in vocabulary. This explains why certain emotions are more easily identified than others. All these results emerge from Gates' study (1923) when he showed actors' photos to children of 3 to 14 years of age. Allowing for considerable indulgence regarding vocabulary, a level of 50 per cent correct replies is attained:

For laughter	3 years and under;
For suffering	at 5–6 years of age;
For anger	at 7 years;
For fear-horror	at 9–10 years of age;
For surprise	at 11 years;
For scorn	over 14 years of age.

Recent studies by Honkavaara (1961) have shown the role of development in the identification of emotion.

(D) THE DIMENSIONS OF EXPRESSIONS

Very varied judgments are made on one and the same photograph. Once the synonyms had been eliminated, Woodworth wondered whether emotional expressions were not ranged on a continuum, that is to say, that for a given pose there would be a corresponding response which would be the most likely and the further the other replies were from it the less probable they were. Applying this hypothesis to the results of several authors, he produced the following linear scale:

I. Love, gaiety, joy;
II. Surprise;
III. Fear, suffering;
IV. Anger, determination;
V. Disgust;
VI. Contempt.

This means that surprise could sometimes be mistaken for joy or fear, but rarely or never for disgust. Schlosberg (1941) reconsidered the problem and found the same scale, but it was not linear but circular. In fact, extreme expressions like contempt are confused with disgust and also with love. Here are the results obtained with six photos whose type of reply corresponds to extreme key-expressions. In the table on p. 164 each column gives the number of replies corresponding to the key-words for each photo.

Taking his analysis further still, Schlosberg (1952) estimated that these six expressions corresponded to two dimensions, pleasant-unpleasant and attention-rejection, passing through different poles as shown in Fig. 12.

Number of photos	6	10	35	63	40	15
Love	67	39	7	2	3	50
Surprise	5	62	21	10	1	0
Fear	0	8	59	5	9	0
Anger	2	0	37	72	17	3
Disgust	2	1	3	29	91	12
Contempt	52	3	2	15	12	54

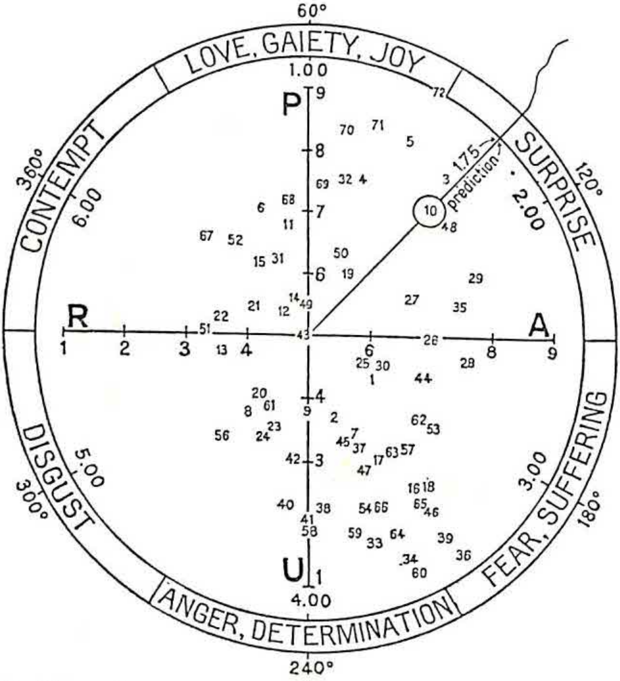

Fig. 12. Position of each of 72 of Frois-Wittmann drawings on a plane surface.

These numbers correspond to 72 photographs of very expressive gestures of the same actor. Fig. 10 (in the circle) gives an example of the method used. Its position is determined by its coordinates on the axes P-U (pleasant-unpleasant) and A-R (attention-rejection). These are 7 on P-U and 7 on R-A, which values are established by direct estimation. A line drawn from the origin of the Axes (5. 5) passing through the point so determined gives at the interesection of this line and the circle the position of the figure measured in degrees. The value so obtained is compared with that got directly from Woodworth's Scale. Here the two values (1·75 on the circle 1·65 on the scale) are very close. (From Woodworth, R. S. and Schlosberg, H., *Experimental Psychology*, Rev. Ed. New York, Holt, 1954, p. 27.)

If these dimensions are correct, there must be strong correlation between the classification of the photos into six categories and that which can be drawn up from two judgments of these photos according to each of the dimensions, on a 9-point scale. Schlosberg, in fact, found correlations superior to 0·90 between the two kinds of identification and that of several studies.

In 1954, Schlosberg, drawing inspiration from the colour solid, thought it necessary to add a third dimension to emotional expression so he proposed a sleep-tension scale. From the different studies carried out on this, it transpired that judgments are true and valid principally on the pleasant-unpleasant scale.

8 *Conscious reactions*

Emotion corresponds to a conscious affective reaction, which is so strong that at first it seems to be a part of the emotion. One recalls historical debates on these conscious reactions, whether they are the cause or effect of organic reactions. The problem today is not put the same way. Consciousness is no longer conceived of as a state but an activity. Awareness is the essential factor. What is its nature in emotion?

One way of discovering it is by studying subjects' reports of emotions they have felt. In the content analyses we have made of students' reports, the following elements predominate:

(a) the description of the circumstances in which emotion was produced;
(b) the perception of organic reactions: palpitations of the heart, sensations of fatigue or lightheadedness, dry throat, clamminess, etc.;
(c) awareness of mental confusion: inability to assemble ideas, memory problems, difficulty in defending one's point of view, etc.;
(d) dealings: pain, joy, shame, contempt, etc.

In the reports we have analyzed, the importance given to sentiments and to emotionality in general is very small compared with the description of situations and organic or ideational disorders. It seems that what characterizes an emotion for the subject is the association he establishes between the situation and the disorders it has produced.

The place occupied by organic disorders in the subjects' consciousness is in proportion to the importance of these reactions themselves, as G. Mandler *et al.* showed in their research (1958). If two groups of subjects are constituted on the basis of perception of their organic disorders in anxiety or *stress* situations, it is observed that those who perceive many disorders have significantly more than those who notice few. However, the fact remains that the chief characteristic of conscious reactions is the awareness of the affective tone of emotion.

What role does it play? The answer is not simple because the role of emotionality in behaviour is poorly understood and remains chiefly the subject of theoretical discussion. McDougall believed that each instinct was linked to a specific affective experience: the instinct of fighting to the experience of anger, flight, fear, self-assertion, elation, etc. P. Janet saw in feelings the reactions of the subject to primary adaptation or non-adaptation, feeling assuring control of behaviour.

However, we may wonder which feeling corresponds to each emotion. Hunt (1937) experimented by asking a group of 224 subjects to indicate the terms which correspond to feelings felt in four emotions—fear, joy, anger, grief. The subjects were given a list of 14 terms in random order. The results are given in the following percentages:

Emotion	*Pleasant*	*Unpleasant*	*Bright*	*Dull*	*Excitement*	*Depression*	*Tension*	*Relaxation*	*Warmth*	*Cold*	*Ease*	*Strain*	*Close*	*Diffuse*
Fear	1	77	5	6	55	14	95	0	8	45	0	82	4	5
Anger	3	73	21	5	59	14	72	2	44	13	2	59	4	10
Joy	96	1	77	0	81	1	9	34	73	0	46	5	1	19
Sorrow	2	86	0	64	0	94	21	8	2	33	3	45	13	10

Repeated on other groups of subjects the experiment gave similar results. The method is therefore correct, but its validity may be questioned. First of all, the terms chosen are arbitrary, which the author himself recognizes. Furthermore, do the subjects' answers convey their experience or do they reflect opinions, the product of social convention, concerning the different emotions? Why does sorrow evoke cold rather than heat? It is more likely to be the result of semantics than experience.

This is one of the difficulties of all observation. We can only perceive our experience through knowledge, but in the case of introspection, cross-checking is not possible.

9 *Reactional 'patterns'*

We have successively examined the different forms of reactions occurring in emotion, but now we must enquire whether reactional *patterns* exist, that is to say, reactions which occur simultaneously in specific situations. We have already examined one aspect of this question when we showed in Chapter 6 that the intensity of neuro-vegetative responses was in inverse proportion to motor activity. However, the problem must be approached as a whole. In W. James's view, as peripheral responses determine the emotion which is felt, there must be a *pattern* of reaction appropriate to each emotion.

Judging from common observation, it certainly seems that different reactions correspond to each emotion, but these observations are principally concerned with motor responses and observation alone cannot give us information on changes in the heart rate or blood pressure. Furthermore, after Sherman's experiments (p. 138) we may well ask whether our interpretation of emotional reactions does not generally depend on our knowledge of the situation. If we meet a man who has just had an emotional shock, it is, in fact, difficult for us to guess his emotion. The difficulties of interpreting facial expressions corroborate this.

Moreover, this problem can only be studied from records, as complete as possible, of motor and neuro-vegetative reactions, but such a project encounters several difficulties, the first of which is obviously that the subject would have to be equipped with many recording instruments to obtain numerous indices. This in itself would create an artificial situation and make the appearance of varying emotions chancy. The second difficulty is technical: the different emotional reactions possess neither the same latency nor the same development (see p. 153).

How can such diverse phenomena be compared and evaluated quantitatively so as to allow a correlation to be calculated for example? There is no satisfactory solution to this problem. In practice, authors have mainly noted the maximum point of the reaction. They have also frequently reported the change observed at the initial stage, which gives an index of emotionality.

(A) THE RELATION BETWEEN EMOTIONAL 'PATTERNS' AND SITUATIONS

Despite these difficulties, several authors have attempted to establish *patterns* with regard to situations. They have tried to establish correlations between one or another form of reaction. The results have been very varied (Woodworth and Schlosberg, 1954, p. 182). Lacey and Lacey's research (1958) gives a fairly precise picture of these phenomena. Forty-two women were studied under very constant conditions in a series of tests, of which we will consider three:

(a) anticipation of a painful stimulus: warning that foot must be placed for one minute in icy water;
(b) test of painful stimulus (cold);
(c) mental arithmetic.

The highest level obtained in several correlations is as follows:

	Rest	*Anticipation*	*Pain*	*Mental arithmetic*
Systolic pressure and heart rate	0·03	0·29	0·34	0·36
Systolic pressure and palmar conduction	0·20	0·06	0·08	0·03
Palmar conduction and heart rate	0·05	0·11	0·20	0·22

In 1951 Ax also tried to differentiate fear and anger responses. Fear was provoked by an electric shock and anger by remarks made to the subject by the experimenter's assistant about his lack of co-operation. Ax recorded the heart rate, blood pressure, PGR, respiration and skin temperature. The average of these correlations is very low (0·12) and it appears that, in both situations, changes occur in the same direction although some are more evident in fear (greater increase of systolic pressure, pulse-rate and PGR) and others in anger (greater increase of diastolic pressure and greater drop in skin temperature on hand and face).

These interesting results show the relationship between fear and anger if one could only be sure that fear and anger were really the emotions experienced.

Davis, Buchwald and Frankmann (1955) studied only the effects of simple stimuli. In all cases there is an increase in PGR and muscular tension. As to the rest, loud auditory stimuli do not cause quite the same responses as strong tactile stimuli or the presentation of pictures of nude women to men. According to Davis (1957), the following table shows the different reactions for a loud noise (N), a tactile stimulus (C) and reaction to the picture of a nude woman (P). The signs indicate an increase or decrease of activity during stimulation as compared with repose. A double sign indicates that either action may be observed.

	N	P	C
P.G.R.	+	+	+
EMG	+	+	+
Pulse rate	+ −	−	−
Pulse volume	−	−	−
Pulse pressure	− +	−	+
Finger volume	−	−	+
Chin volume	+	−	+
Respiration rate	−	−	+ −
Respiration depth	+	−	− +

Davis, however, does not think that specific *patterns* emerge.

Schnore's more modest list (1959) shows four indices differentiating high and low levels of activation, heart rate, blood pressure, respiration rate and tension in right forearm.

(B) EMOTIONAL 'PATTERNS' AND INDIVIDUALS

Although it has not been possible to establish definitely the existence of emotional patterns in relation to situations, the explanation may lie in the fact that, as several studies have shown, individual *patterns* of identical reactions occur in different situations.

Lacey (1950) established that individual *patterns* of response exist. He measured the systolic and diastolic pressure, pulse rate, PGR, cardiac rhythm and its variability in patients lying down. The subject is required to name as many words as possible beginning with a particular letter. The measurements taken during rest periods and periods of mental effort were repeated ten times during a period of up to 300 days. Results show that each subject has his own *pattern* of response and that this *pattern* is stable over a period of time.

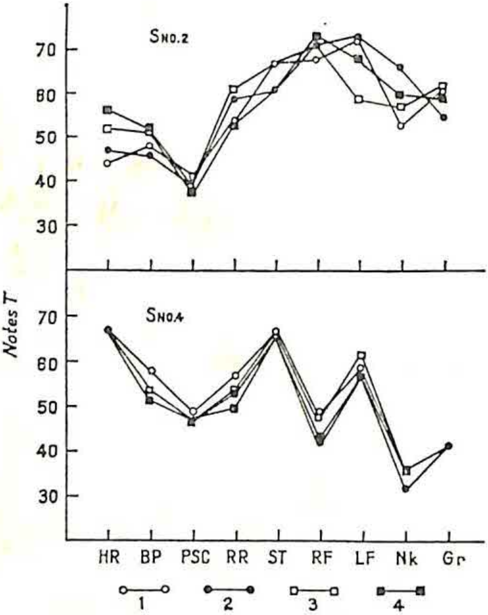

Fig. 13. Two cases showing the consistency of response patterns in different tasks and at different arousal levels.

(1) Low arousal tracking;
(2) High arousal tracking;
(3) Low arousal arithmetic task;
(4) High arousal arithmetic task.

HR, heart rate; BP, blood pressure; PSC, palmar cond.; RR, Resp. rate; ST, Skin temperature; RF, ENG on right forearm; LF, EMG on left forearm; Nk, neck; Gr, strength of grip. (From Individual patterns of physiological activity as a function of task differences and degree of arousal by M. M. Schnore, *J. Exp. Psychol.*, 1959, 58, p. 122.)

Schnore (1959) showed with nine different responses that subjects reacted in the same way whether they were carrying out a pursuit task or arithmetical work and whether these were done in a state of high or low motivation. Fig. 13 shows the diversity of reactions of two subjects, and also the stability of these *patterns*, whatever the task or the level of motivation.

These results do not wholly correspond to emotions but corroborate our everyday observations—everyone has his own way of reacting in anger, fear or joy.

10 Repetition of emotions and psychosomatic effects

A disturbing situation constitutes by its very violence an attack on the organism. We have seen that, in such cases, the mobilization of energy could not be used in adaptative reactions; excitation produced a biological trauma characterized essentially by functional disorders of those organs innervated by the sympathetic and parasympathetic systems. Frequent emotional reactions occur when a subject finds himself in a permanent state of tension or conflict. While not spectacular in themselves, these reactions may, however, produce neuro-vegetative disorders of the stomach, intestines, heart or the mechanisms controlling the blood pressure, etc.

These emotional states, as we have seen, are mainly present in the subjective state of anxiety.

However, neuro-vegetative reactions do not depend on the current emotional state alone. By conditioning, the neutral stimuli which have been associated with emotive stimuli may provoke interoceptive reactions: these have been studied particularly by Bykov (1956). We have seen, for example (p. 156), that a patient learning of a bereavement while at table vomited each time afterwards when she was given similar food. It has been demonstrated with diabetics who are used to insulin injections to decrease the blood sugar level, that a neutral injection of physiological liquid will produce the same effect. A draught which does not cause a chill may produce changes in the heat control mechanism because draughts usually cause chills. Neutral stimuli may be at the root of subconscious organic reactions. It is clear that our past emotions, and particularly those of youth, have slowly established patterns of responding which are more stable than those environmentally acquired.

What are the effects of repeated excitation? Cannon thought that emotion released a flow of adrenaline for the organism to adapt to the danger it faced.

From 1936 onwards Selye developed studies on what he calls the general adaptation syndrome. *Stress*, that is to say, a physical attack on the organism (a loud noise) or a psychological attack (fear), creates an alarm response, the first stage of which is shock with hypotension, hypothermy, hypoglycaemia, etc., followed by a period of counter-shock when reactions are reversed due to the discharge of adrenaline stimulated by ACTH, the hormone of the pituitary gland. Injection of ACTH produces counter-shock symptoms to the alarm reaction, whereas hypophyseal ablation eliminates neuro-vegetative changes.

The alarm responses form a stage of resistance while the organism adapts itself to *stress*, but if this increases in quantity, resistance stops and the subject reaches a stage of exhaustion which is really an illness of adaptation. At this stage physical damage arises—gastric ulcers, thymo-lymphatic destruction, etc.

But, in reality, Selye's syndrome is only one example of the effects of irritation of the sympathetic nervous system. Violent irritation of the sympathetic fibres can cause lesions and even ulcers by its effect on the capillaries. The phenomenon occurs like this: the sympathetic fibres act on the organs they innervate through the intermediary of chemical agents. Over-production of these agents produces an abnormal state in the effector: the cells become poorly nourished and waste products are not eliminated adequately. This leads to the appearance of toxic substances arising from the functioning of the cells, particularly histamine, which increases nervous excitability, and thus accelerates the disturbance. These processes may cause intestinal, cardiac, pulmonary, cutaneous or even cerebral lesions, as Reilly has shown (P. Chauchard, 1955). It is in this way that a functional disorder may cause a lesion.

This is as true on the psychological as on the physiological level. Dunbar's work (1938) firmly established that numerous so-called psychosomatic diseases could, in fact, be the effect of emotional troubles: the ulcer of the stomach is the most typical case. Excellent clinical examples may be found in Grinker and

Robins's work (1959). These illnesses have even been reproduced in animals. Sawrey *et al.* (1956) carried out the following experiment: a control group and an experimental group of 50 rats were placed in two different boxes for 30 days. Both groups were fed for only one hour every two days, thus creating a state of hunger and thirst. The experimental group's box had platforms with food at one end and water at the other, and to reach the platform the animals had to cross a grid where they received electric shock. The sight of the food combined with the impossibility of reaching it constituted a source of permanent *stress.* After 30 days all the animals were killed and it was found that 76 per cent of the experimental group had ulcers (434 altogether) and only 20 to 30 per cent of the control group which had suffered only from hunger and thirst without undergoing the torment of Tantalus.

In addition to biological damage, emotion causes neuroses and even psychoses. Conversion hysteria is yet another neuro-vegetative disorder since emotion is interpreted symbolically in terms of environmental influences (Delay, 1961).

The research of Pavlov and his students and those of Liddell (p. 160) showed how experimental neuroses appear in an animal which finds itself in a conflict situation. They are first of all evident in classical emotional reactions: agitation, aggression towards the harness and apparatus, or, alternatively, inhibition with catalepsy. If the experiment is continued, the animal shows disturbed behaviour, even in its cage, and these disturbances may become permanent (Cain, 1959).

4 Emotionality

1 Emotionality as a personality trait

Emotionality consists of sensitivity to disturbing situations and may be weak or strong in principle, but it is usually used to characterize people having stronger and more frequent emotional reactions than the average. Emotionality is always synonymous with hyper-emotionality.

The crucial studies made about character, which lacked the scientific method, sought to discover the fundamental traits of human personality through observation, and they generally regarded emotionality as a fundamental constituent.

Hippocrates distinguished a choleric temperament among the four fundamental temperaments. In modern times, Ribot (1892) distinguished the sensitive nature from the active and the apathetic; Malapert (1897) regarded emotional characters as a particular type of sensitivity which also included apathetic, sensitive and passionate natures; Delmas and Boll (1922) considered emotionality as one of the five constituent factors of personality; Burloud (1942) distinguished between the excitable, the depressed and the phlegmatic.

However, the three constituent factors of personality—emotionality, activity and repercussion—were singled out by Heymans and Wiersma (1908 and 1909) in their large-scale investigation. The definition of emotionality is given in their question No. 9: 'Is this person emotional (taking trifles to heart more than other people; becoming enraptured or bursting into tears easily) or non-emotional (less sensitive than other people, a cold sort of character)?'

Gauchet and Lambert (1959) analysed G. Berger's questionnaire based on Heymans and Wiersma's dimensions. They found that only one general factor accounted for the pattern of intercorrelations obtained on nine questions relation to emotionality, the first question, similar to the one quoted above, having the greatest factor loading.[1]

However, these results were only obtained through replies to a questionnaire with a large degree of redundancy where the questions overlap and the distinction between affectivity and emotionality is not sufficiently made.

2 *The components of emotionality*

The difficulty of measuring emotional reactions has been mentioned. However, several authors have subjected the results of extensive studies to factorial analysis.

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[1] Gauchet and Lambert's work also showed that the three main factors—emotionality, activity and secondarity—brought out in G. Berger's questionnaire, are not independent. Emotionality and secondarity are independent, but there is a negative relationship between emotionality and activity.

Freeman and Katzoff (1942) studied 30 indices in various traumatic situations: 10 measure physiological activity (increase in PGR and in the time taken to return to rest): 11 measure muscular activity (the subject lies on a pneumatic mattress which records his movements) and 9 are estimations based on personality questionnaires (neurosis, anxiety, self-control, disturbed somatic state).

The factorial analysis, made on only 24 subjects and based on rank correlations, produced three factors. The first, called emotional control, corresponds to a rapid return to calm and little increase in movements during the tests. The second, called *arousal* or excitability, corresponds to a strong loading in the four measures of increase of conductivity during tests involving movement. Finally, the third factor refers to the questionnaires and may be called 'self-estimation of emotionality'.

Burt (1950) whose first work on this problem dates from 1915, based his research mainly on the results of interviews, observation over a period and observation in standardized situations. By applying his own method of factorial analysis, he repeatedly found:

(a) a general factor of emotionality corresponding to 40 or 50 per cent of the total variance;
(b) a bipolar factor which divides emotional reactions along an axis of sthenic-asthenic or, if one prefers, extravert-introvert or, even aggressive-inhibited. This factor contributes about 13 per cent of the variance;
(c) a second bipolar factor of lesser importance distinguishing euphoric and dysphoric reactions.

The general factor carries more weight with children than with adults. The first bipolar factor is similar to the distinction drawn by Sheldon between the expression of emotions among viscerotonic types (direct and with poor control and cerebro-tonics —'repressed'—they do not give way to emotion and do not cry).

Cattell (1956), crosschecking many factorial analyses of personality, found that there were a certain number of similar factors, amongst them 'factor C' which he first found in analyses based on estimates of behaviour in real situations.

This is a bipolar trait ranging from an affectively stable character to a general neurotic emotionality. The main symptoms opposing each other are as follows:

C plus	*C minus*
Affectively stable	Dissatisfied, emotional
Not presenting neurotic symptoms	Presenting various neurotic symptoms
Not presenting hypochondriac components	Hypochondriac, complaining
Stable, self-controlled	Changeable
Calm, patient, etc.	Excitable, impatient, etc.

Factor C also emerges in an analysis of replies to questionnaires and appears thus: a tendency towards introspection, stability and affective maturity, as opposed to general emotionality. Here is a selection of these questions:

Does lack of good manners or immorality in others worry you sometimes out of proportion to its importance?

Do you often feel worried and tense for little or no reason?

Have you a tendency to stick to one subject in discussion and do you feel difficulty in following those who fly from one subject to another? (Affirmative reply indicates stability.)

Do exciting emotional situations overwhelm you and do you try to avoid them? (Negative reply indicates stability.)

Although a similar factor may be found in objective observation and self-reporting questionnaires, Cattell points out that the correlation between them is not high and he thinks that the right questions have not yet been found which illuminate the factor of affective stability. One might also think that there is always a difference between a subject's behaviour and his own evaluation of it.

One point of agreement runs through these studies: there is a chain of connected behaviour which corresponds to the subject's susceptibility to events. Mounier, by analogy with the characteristics of living matter, proposed calling it psychic irritability (1946).

3 *Emotional constitutions*

Is emotionality constitutional or is it the result of one or more emotional shocks? On the basis of his observations in psychopathology Dupré was the first to speak of an emotional constitution characterized by 'imbalance of the nervous system typified by diffuse erethism and inadequate motor, reflex and voluntary inhibitions, causing the organism's reactions to shock to be abnormal in their strength, extent and duration, and thus showing it to be more or less incapable of adaptation to sudden circumstances, unforeseen situations or new surroundings' (1925, p. 295).

Is this really constitutional, that is to say, a collection of hereditary somatic data? Dupré,[1] Delmas and Boll thought so from their clinical observations. Experimental research on man is delicate, especially as it is difficult to measure emotionality and it also changes with age. It would be necessary to study parents and children of the same age, that is to say at an interval of 20 or 30 years, in identical conditions and with comparable methods for any research to be conclusive. Lacey (1956) attempted this and found correlations between the neuro-vegetative responses of mothers and children.

What is difficult with man is possible with animals. Hall (1941) conducted an important experiment using his emotionality test. He had often observed that urination and defecation occurred frequently among rats put in traumatic situations. Hall had the idea of putting the rats in a disturbing situation, for example, in the middle of a brightly lit field. If urination and defecation are signs of emotionality, they ought to disappear when the experiment was repeated and all the quicker the less emotional the animal is. Hall found that this criterion correlated closely with food refusal which is also considered an unequivocal sign of emotionality; he also obtained high correlations by using this criterion in various disturbing situations.[2] Using this test, Hall studied the heredity of emotionality. He divided a number of rats into two groups—emotional rats (which continued to urinate and defecate for several days during the test period) and unemotional rats. By breeding within each group, he obtained the following results over eight generations (the figures indicate the number of days in which the rats urinated and defecated during a series of 12 tests).

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[1] Dupré also thinks that this constitution may be acquired.

[2] The emotionality factor measured by Hall's test has also been found in Billingslea's factorial analyses (1942) and also in Willingham's (1956). In addition to this chief factor, Billingslea found a freezing factor (trembling with fear) and a timidity factor. Willingham found a factor of bodily care (grooming) and a factor of reaction to the experimenter in addition to elimination and freezing factors. These studies confirm the value of Hall's criterion.

	Emotional	*Unemotional*
G1	3·07	0·46
G2	4·72	1·94
G3	3·92	1·02
G4	4·69	1·40
G5	4·96	0·41
G6	6·87	0·51
G7	7·82	0·17
G8	8·37	1·07

Whereas the unemotional group remains stable, the emotional group becomes increasingly so.

Hereditary influence is evident, as has been confirmed by later studies.

Yeakel and Rhoades (1941), studying the anatomical differences between the two groups of rats, found that the emotional group had larger adrenal, thyroid and pituitary glands than the unemotional group.

Pavlov and his school approached the problem rather differently. Pavlov thought that temperament was based on two antagonistic nervous processes—excitation and inhibition—whose balance determined two types. In addition, he distinguished two other types, one weak but predominantly inhibitory, the other strong but predominantly excitatory, an excitable character lacking self-control, which he compared to Hippocrates's choleric type. The emotional type falls into this category. Pavlov (1955, p. 170) thought that these differences between animals or humans depended on the *type* of nervous system itself and also on influences to which it had been subjected since birth. Krasnagorski (1955) found Pavlov's types in children, particularly the strong, easily excitable type of child lacking in self-control. This type is characterized physiologically by a predominance of the sub-cortex over the cortex.

It seems well established that there are physiological constitutions which predispose to emotionality. The word constitutions is used in the plural because it is possible that emotionality stems from different conditions in different individuals. This point will not be made clear until we can draw up the endocrine and nervous balance-sheets more accurately. In any case, the search for physiological components will always be difficult because it involves interpreting the data and the effects of experience.

4 *Acquired emotionality*

Exaggerated excitability in difficult situations may be due to one or more previous experiences which have sensitized the subject in a general way.

It will be readily understood that these experiences are more likely to occur to subjects with an emotional constitution, but it does not seem that this condition is absolutely necessary.

Without being an emotional constitution in the strict sense of the word, it has been shown that poor health increases emotional reactions. Stratton (1929) drew comparisons between the medical files of 1,000 students and their replies to a questionnaire on frequency of fear and anger, and came to the following conclusions:

1. People who have at any period undergone a severe illness respond more intensely to situations which may provoke their anger (and doubtless also their fear) than those who have always enjoyed good health;
2. Among people who have been ill, those who have suffered from a wide range of illnesses respond more intensely to situations which may provoke fear (and doubtless also anger) than the others;
3. The age at which they were ill plays an important role. Fear is linked principally to illnesses between 11 and 15 years, anger to infantile illnesses prior to the age of six. It may be questioned whether these results can be explained solely in terms of previous illness. Are not those who have had the worst illnesses suffering from poorer health which would render them particularly susceptible to emotion? However, there is no doubt that illness as a psychological experience can have a certain effect.

We have seen that certain emotional reactions were conditioned. If conditioning has a lasting influence, we can say that it is a source of emotionality.

Hall and Whiteman (1951) carried out the following experiment. They took two groups of similar rats brought up under the same conditions, except that during the first week of life the experimental group was subjected to a very intense, piercing noise. At maturity, the two groups were tested by Hall's method (number of days before urination and defecation cease in a traumatic situation) and they found that the experimental group showed emotional reactions for longer than the control group.

As we have already mentioned, Liddell (1956) was able to produce in sheep (or goats) states of emotionality that he considered to be long-term experimental neuroses. If a sheep is given an electric shock in the leg, preceded by a 10-second warning signal, and if this sequence of signal followed by shock is repeated every 5 minutes, after a certain time, instead of remaining calm between signals, the animal becomes agitated, the heart rate and respiration become irregular and it reacts violently to each electric shock; the most remarkable thing is that outside the laboratory the animal shows anxiety both day and night, in the pasture and in the fold. If anyone approaches, it runs away; at night, instead of sleeping, it remains awake and shows cardiac acceleration at the slightest sound. These effects last a long time. Liddell observed them several years after an experiment. It is remarkable that if electric shock is not preceded by a signal, these phenomena do not develop.

The same phenomena, which are not easy to study experimentally, are also seen in man. During the last two world wars, soldiers subjected to intense and repeated bombing had to be evacuated. They could not bear the slighest sound because of the shock they had undergone.

The effect of emotional shocks may be more or less diffuse and emotionality may also be more or less selective. Phobias are specific fears (claustrophobia, nosophobia, ereutophobia, etc.) which are usually the result of emotional shock (Lacroze, 1937). A complex, in Jung's sense of the word, is a cluster of feelings and attitudes which have not been properly integrated in the personality. Generally, a complex has its origin in conflict and is shown by violent and often ambivalent reactions to certain situations or stimuli. Adler's inferiority complex is the classic example.

At a higher level of generality, anxiety or feeling of imminent and indeterminate danger combined with a sense of incapacity is a source of numerous emotional reactions. The anxious person, whatever the origin of his anxiety, is emotional, and Malmo (1950) showed that placed in painful situations (heat applied to the forehead) the anxious subject trembles and moves his head more, has greater neck muscle tension and respiratory irregularity than subjects of a control group.

In short, among emotional subjects, whether due to constitution or painful experience, there is a strong mobilization of energy which is difficult to control and which frequently brings with it emotional reactions, whereas among non-emotional or less emotional subjects only adaptive responses are observed.

5 *Emotional maturity*

All things being equal, the child appears more emotional than the adult.

Certainly, as the child grows, its emotions become differentiated. He becomes sensitive to new stimuli and new motivations develop, particularly after puberty. However, from the point of view of this chapter, decrease in the absolute frequency of emotions is the most important thing. There is nothing unusual in this way of looking at it. Maturity is essentially characterized by the development of self-control and by learning adaptive responses to the different situations which confront one. The child is overwhelmed by a physical world full of surprises and by complex social situations where he plays only a minor role. The adult foresees situations which may confront him and is capable of adapting his reactions far more than the child can. Moreover, even if he cannot always avoid emotion, at least he is capable of inhibiting the motor reactions and cries which are under voluntary control.

If this picture is true in its broad outline, the fact remains, as Jersild has already remarked (1952), that our knowledge in this field is still very incomplete. Only patient longitudinal research will enable one to gain a precise picture of the genetic development of emotion.

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Chapter 17

The structure of the personality

Richard Meili

1 Introduction

1 Definition

The term personality has been variously defined and Allport (1949) mentions 50 different definitions. These differences do not affect the subject of our study, but rather its conceptualization, and therefore the theoretical differences of the various authors' approaches. In this chapter, in which present-day knowledge of the structure of the personality will be set forth, we will limit ourselves to defining the subject whose structure we have to study. The definition of its nature can only result from research and cannot precede it. As to this subject, it is simply man as we see him in the street, at work or during his leisure-time. By the term personality is meant, therefore, the *psychological whole which characterizes a particular man*. Personality, therefore, is not an abstract idea, but this living being whom we observe from without or feel from within and who is different from every other member of his species. The psychology of personality must, therefore, always take these individual differences into account, and its task is to define them more exactly and explain them.

2 Three aspects of personality

Taken in a very broad sense, the notion of personality includes character, temperament and aptitude, each of which may be regarded as a particular aspect of it.

With respect to any action, three questions may be asked, although any one of them may be the most important. We may enquire about the method, the means used to accomplish the act, or the way the action evolves, its strength, formal dynamics, speed, regularity and intensity; or, finally, we may enquire into its significance, its source or its purpose. The response to the first question is expressed in terms of aptitude, the second in terms of temperament, and the third in terms of motivation. Before this idea was accepted, the term 'character' designated anything in the personality belonging neither to aptitude nor to temperament. There is, moreover, relative agreement regarding temperament, in the sense indicated, as definitely springing from innate disposition, while with aptitudes and even more with motivation, account must be taken of the influence of events, or, in other words, learning.

3 Theory and experience

Personality is the last and consequently the most complex part of psychology. In a way, it comprises all psychology and there is no experiment in psychology which does not contribute to the knowledge of personality. This observation is in no way exclusivist and does not claim to set the psychology of personality up as a controlling discipline, but merely intends to stress that everyone studying personality should be aware of other fields of psychology.

In this chapter we discuss the structure of personality. The idea of structure implies that the multiple and ever-varied manifestations of personality are determined by a stable underlying structure. Most definitions of personality, in fact, are aimed at describing this structure. As it is a complex whole with innumerable qualitative variations, its fundamental components and essential types must be discovered if a clear picture is to emerge.

The experimental study of the structure of personality is relatively recent and today the number of 'theories' of personality is still in inverse proportion to the number of systematic studies. This disproportion is inevitable in a field where each experiment can cast light only on a small part which is quite inadequate in relation to the magnitude of the real objective. From time to time it is necessary and useful to summarize all the facts which have been accumulated and it is also reasonable to use one's personal and intuitive experience. However, this overall view has only a provisional and partial value in that it indicates what might be able to be verified experimentally. No statement will be made here, but it will be necessary sometimes to look at the underlying theoretical concept of certain studies.

4 Methodological problems

It is important to reflect a few minutes on general methodology in order to understand the particular difficulties involved in research into personality. In a standard experiment in physico-chemistry, the changes in a variable depending on the action of an independent variable are studied and controlled by the experimenter. In psychology this experimental method has also proved the most fruitful, but it is hardly applicable here. In the most general case, a questionnaire or test is given to a group or groups of subjects and their behaviour observed in a given situation in order to note any variation in response. The variable, independent in this case, is thus the personality structure of the subjects. However, this variable is not controllable since it is precisely this which is the unknown factor which the experiment seeks to discover. This going round in circles explains why progress is so slow in this field of psychology and also why very different theories can co-exist without its being possible to come to a decision by experimental means.

There is a temptation to reduce the vagueness of the independent variable by studying, not individual variations, but those of more or less precisely defined groups. For example, changes in reactions may be examined in relation to age, sex or clinical groups (e.g. schizophrenics, manics, neurotics). As far as these groups are well defined and sufficiently specific—which is not often the case—this method comes closest to genuine experimentation. A further step may be taken in this direction by choosing subjects on the basis of preliminary experiments (e.g., from the results of a test of general anxiety, introversion or rigidity, etc.) or several of these criteria simultaneously. However, such studies require considerable preparation, since there are various difficulties involved in setting up homogeneous groups. They are meaningless unless fairly precise hypotheses can be made about the concomitant variations and unless the criterion chosen for the selection of the groups has a precise psychological meaning.

Few studies are carried out in this way at present, most of them being made in one or other of the following ways:

A) Using so-called projective tests, the responses are treated as reflecting the whole personality and, from the individual variations in the responses, an attempt is made to devise a model of the structure of personality. However, these interpretations must obviously introduce hypotheses about the structure of personality and the final result is thus partly determined by these hypotheses.

B) The relationship between personality trait, determined, for example, by a questionnaire or test, and other variables is examined. In this case, the qualification of the trait representing the independent variable must be considered exact. In reality, in these experiments one compares two manifestations whose relation to traits or fundamental personality variables is hypothetical. This method can be of value only if the independent variable has been adequately defined in preceding experiments.

C) To avoid these difficulties, the factorial method is used, which enables simultaneous analysis of a battery of results. These define the variables which can explain the relationship between the primary data. Difficulties arise in interpreting the factors, as this can only be done if the psychological significance of at least some of the measured variables is known; generally, however, this knowledge comes through intuition alone.

It is, therefore, impossible to be entirely free of imprecision about the independent variables, but the points where preliminary hypotheses intervene in the selected procedure must be clearly noted and care taken to reduce them as far as possible. It is useless to try to restrict the choice to operationally defined variables in this field, because this would mean one could not touch on the real problems. Only by degrees will important concepts be defined and precise experiments become possible.

5 *The means of investigation*

In principle, the appropriate method of investigation in this field is direct observation of behaviour, since everyday actions in real situations, at home, at work, in communication with friends or strangers, amicable, indifferent or hostile, constitute the true expression of personality. Because it is impossible in practice to observe one person's entire behaviour and because it would be arbitrary to consider only chance facets of different subjects—incongruous data that are difficult to compare—it is necessary to use special techniques, the principal ones being the following:

(A) BIOGRAPHY AND AUTOBIOGRAPHY

These documents are closest to direct observation because they cover the whole life in its most important aspects, but they may be tainted with subjectivity and certainly do not give a complete and objective reflection of the behaviour of a person. The scope of the observations may, however, partly compensate for these defects. Heymans (1908) seems to have been the first to use this source of information in a systematic fashion, and there is no doubt that detailed comparison of autobiographical notes of behaviour in very ordinary situations may give interesting results. Voutsinas (1959) stressed the value of such studies and drew up a few rules.

(B) QUESTIONNAIRES

Questionnaires are frequently used to avoid judging someone on the basis of a few, isolated observations which may show uncharacteristic behaviour patterns. The questionnaires may be filled in either by the subject himself or by a third person—parent, teacher, friend, etc.—and may concern behaviour traits, character, interests and attitudes, etc. Heymans and Wiersma (1908) were the first to use this method on a large scale. There is reason to believe that the replies to questionnaires reveal more constant, less unreliable characteristics than occasional observation, but sources of error in this method are naturally numerous. They have more weight in the case of an individual diagnosis than when co-variations of the variables are calculated. Widespread uses of this method will be seen on p. 261.

(C) EXPERIMENTAL SITUATIONS

A further method of avoiding the dangers of occasional observation consists in creating experimental situations which are strictly similar for all subjects. This method has the advantage of being objective, but unfortunately it greatly limits the field of investigation. Not only is its application complicated and long, but the choice of situations is necessarily limited. It is almost impossible, for example, to create experimentally clearly defined situations of frustration, deception or danger. Also it is impossible to be sure that the subject's reaction is the same as it would be in an analogous but non-experimental situation. Although this method has not been used widely, the work on selection of officers for the British and American armies (*assessment of personality*) must be mentioned.

(D) THE TEST

Examples of this method are the Rorschach, T.A.T., Szondi, Village tests, etc. They are now usually called 'projective tests' in which the term projective vaguely means 'reflection of personality'. The feature of these tests is the relatively unstructured nature of the material. Because of this, the responses are largely shaped by the nature of the subjects, and are therefore considered reflections or projections of the total personality. They are, therefore, copious and it is difficult to isolate particular factors precisely. The responses are interpreted in relation to a particular concept of personality that needs constant verification. This circle is unavoidable in a science where definition of the whole must be made by means of its dependent parts; the circle becomes vicious unless it is remembered that analysis of the results can only provide hypotheses which should provide the basis for new experiments. Truth can be found only by a process of progressive adjustments.

In addition to these global tests, 'analytic' tests may be conceived whose object is to elucidate one aspect or one quality only of personality—extraversion, sense of humour, decision, etc. The hypotheses resulting from the use of global tests must be submitted to verification by special tests containing fewer variables, the construction of which is beginning to be envisaged.

(E) EXPRESSION

Physiognomy was one of the earliest means of studying personality. Without going back to remote times, we may quote La

Chambre (1648) and Lavater (1770), both of whom used it fairly systematically. Nowadays handwriting has taken the place of physiognomy. Scientific research has not employed these means, which have been discredited by the unscrupulous use made of them. However, the hypothesis that personality is expressed in physiognomy, handwriting, gestures, speech, etc. is as well founded as that which recognizes that personality is projected into drawings, story-telling, etc. There is no justification for excluding so important a part of available information.

It is possible by these different research methods to reach one or other of the three aforementioned aspects of personality. Aptitude tests provide information principally on abilities, and interest and projective tests such as the T.A.T. on motivation: other tests and manifestations of expression shed light mainly on temperamental traits. By direct observation of real behaviour the three aspects may be considered in turn. Up till now very little is known about their degree of dependence or independence, and it is wise to remember that they cannot exist separately, although they are considered individually for the purpose of analysis.

6 *Plan of the chapter*

The history of research in the structure of personality does not appear to be a sequence of interdependent discoveries leading to an ever-clearer and more differentiated theory, but rather a succession of independent attempts starting from different theoretical viewpoints and using different research methods.

Although at the outset the dominating tendency was to think of independent traits as analogous to independent faculties, more synthetic views crystallizing around typological theories followed later. At a later date factorial analysis provided a research tool and theoretical approach which again favoured the analytical method. Psychoanalytic theories and Lewin's field theory introduced a dynamic approach into research on personality and, inspired by the behaviourist learning theory, led to the study of the formation of personality.

These trends all continue to inspire many works and the possibility of a synthesis of various different pieces of knowledge becomes increasingly likely. At present, however, such a synthesis could not be carried out without resolving many troublesome questions by speculation. In this chapter we will only consider the principal results of the various trends in research. Such a study must necessarily include a certain subjective element, at least with regard to the importance of the problems, but I have tried not to omit anything which, at the level of experimental research, has left its mark on the psychology of personality and which looks as though it might be of use.

As regards the arrangement of the material, I have taken into account both historic and methodological principles, neither of which was entirely satisfactory alone. In parts 2, 3 and 4 we will look at the three main kinds of research on definition of types, properties and fundamental factors of personality in the approximate order of their appearance. Parts 5 and 6 concern genetic research and studies on the growth of personality.

2 The relationship between the physical and mental aspects of personality

By direct observation we perceive many specific aspects of personality, or its global form, but its structure eludes us; this must be defined from observation. The anatomist and the physiologist find themselves in a better position in this respect. This may perhaps explain why psychologists have always tried to relate the physical and mental aspects of personality. Indeed, if certain psychic traits of personality were associated in a constant and rigorous manner with particularities of the body or physiological processes, they could be considered more important. A second reason which prompts the search for correlations between physical and psychological traits is the hope of being able to separate innate factors from environmental influences or, more generally, from the history of the individual.

1 Isolated traits

Many studies have been carried out on the correlations between measurements of the cranium and the body on one hand and intelligence on the other. The first of these was Pearson's in 1906 which produced completely negative results with the exception of a very small relationship between height and weight on the one hand and intelligence on the other, particularly during the period of growth.

These rather disappointing results did not encourage research into the relationship between physical and other psychological variables whose measurement is more difficult than that of intelligence. Eysenck (1960) gives what is probably the most comprehensive resumé of these studies. Significant correlations are very rare and almost never exceed 0·30. Darrow and Heath (1932), in one of the most important works in this field, used Thurstone's inventory of neurotic tendencies, the Northwestern University introversion-extraversion test, a blood-pressure test, movements of the arm, respiration and psychogalvanic reflex in different situations. Out of 240 correlations, only 19 exceed 0·20, which is significant at the 0·05 level.

2 *Types*

At first sight the picture is quite different with regard to typological researches.

(A) KRETSCHMER'S TYPOLOGY (1921)

To avoid the almost infinite number of individual differences there have always been attempts to class them into a small number of typical portraits. Hippocrates's theory of the four temperaments is the oldest and best-known example of an attempt to relate psychological and physical types. Since the publication in 1921 of Kretschmer's work *La structure du corps et le caractère* ('The structure of the body and the character'), these typological studies have been scientifically based. Kretschmer insists on the scientific character of his types and distinguishes them from the more or less arbitrarily designed 'ideal' types used for grouping individuals. Kretschmer started with the clinical distinction, introduced by Kraepelin, between *dementia praecox*, which became known as schizophrenia after Bleuler's studies, and circular psychosis (manic-depression); he observed a fairly clear correlation between these two forms of psychosis and bodily structure. The *manic-depressives* belong mainly to the physical type called *pyknic* characterized by 'medium height, large trunk, broad slack face on thick neck . . . fat abdomen from which emerges a bulging thorax which widens out lower down'. On the other hand, with *schizophrenics* the *leptosomic* structure is more usually found, characterized by a thin body of normal height. To these two principal physical types must be added the athletic and the dysplastic types which are less well defined and whose mental correlations are not very specific.

The following table gives a resumé of the results of different studies where epileptics are considered in addition to schizophrenics and manic-depressives.

TABLE I

Distribution of categories of psychoses according to different physical structures
(After Westphal, quoted by Kretschmer)

		Psychoses		
Bodily types	*Schizo-phrenics*	*Manic-depressives*	*Epileptics*	TOTAL
Leptosomic	*2,632*	261	378	3,271
Pyknic	717	*879*	83	1,679
Athletic	884	91	*435*	1,410
Dysplastic	550	15	444	1,009
Atypical	450	115	165	730
Totals	5,233	1,361	1,505	8,099

These figures show a very clear relationship between the physical and psychic structures for the three principal categories ($X^2 = 26{\cdot}40$ where a value of $20{\cdot}09$ would be significant at a $0{\cdot}01$ level). However, many cases cannot be classified under one of these three headings and are not associated with specific mental types.

As these facts concerned relatively rare pathological cases only they would perhaps be without great interest for the psychology of personality if Kretschmer had not enlarged the field of his investigations. For him, psychoses are only 'rare exaggerations of large constitutional groups, spread out amongst the normal', and he described two types of personality: the schizothymic and the cyclothymic whose extreme and pathological states take the form of schizophrenia and manic depression. These types have numerous variations of which the most characteristic are the following: among the cyclothymics, there are the 'joyful chatterers', the 'calm humorists', the 'calm sentimentalists', 'the pleasure-seekers after satisfaction', and the 'active practical' types; among the schizothymics, Kretschmer describes the 'refined and distinguished minds', the 'idealistic dreamers', the 'cold and egoistical dominators', the unfeeling and the sluggish.

The correlation of these typologies with physical structure is not as well established for normal personality as for pathological cases. Kretschmer cites only three works where groups of normal subjects, belonging to two or three physical types, replied to a questionnaire aimed at delimiting the two mental types. The results are shown in Table II.

TABLE II

The relationship between physical and psychological types in normal subjects

(After Van Horst, 1924; Kibler, 1925 and Lüth, 1936)

		Cyclothymics		*Schizothymics*		*Miscellaneous or undefined*
Author of work	*n*	Van Horst Kibler	Lüth	Van Horst Kibler	Lüth	Van Horst Kibler
Pyknics	69	94·4%	93·8%	2·8%	6·2%	2·8%
Leptosomes	125	12·2	7·6	70·7	92·4	17·1
Athletics	29		18·1		81·9	

It is clear, therefore, that pyknics can be regarded as cyclothymic and leptosomes and athletics a little less specifically as schizothymic. It should be said, however, that this research does not entirely fulfil the necessary scientific conditions, since variables such as age, occupation and social status are not adequately controlled (this question will be considered later, p. 207).

(B) SHELDON'S TYPOLOGY

Sheldon's work in the United States from 1927 was concerned with the research for fundamental components common to different levels of the personality. Contrary to Kretschmer, he refused to think of a type as being defined by a characteristic group of physical or psychological traits; he first tried to define certain fundamental dimensions by which individuals could be classified. According to him, the corporal structure is determined by three components:

1. Endomorphy (large digestive viscera, weak somatic structure),
2. Mesomorphy (predominance of somatic structure),
3. Ectomorphy (long, thin body with flat chest and general frailness).

The measurement of 17 diameters enables the 'somatotype' to be determined, expressed by a formula of three figures from 1 to 7, each indicating the place which the subject occupies on the 7-degree scale for each of the three components. Thus, for example, a 1, 5, 7 subject has 1 degree for endomorphy, 5 for mesomorphy and 7 for ectomorphy.

In a similar way and on the basis of correlations between a certain number of traits, Sheldon established three groups of psychological components of personality or, as he called it, temperament (1951). Table III shows the traits which make up Sheldon's scale.

It will be noticed that Sheldon's somatotypes correspond to Kretschmer's three physical types and the characteristic traits of viscerotonia and cerebrotonia agree with the typical picture of cyclothymics and schizothymics. Sheldon also finds a correspondence between the physical and mental forms of personality, as shown in Table IV.

The correlations between the corresponding physical and mental types are astonishingly high. All the others are negative, some quite strongly; this indicates that the components are not independent but cancel each other out, which seems somewhat curious. Ekman (1951) showed that the components in the two areas could be reduced to two. He also mentions that other studies on Sheldon's system do not yield such high correlations between temperament and somatotype. Child (1950), for example, found correlations of only 0·13, 0·38 and 0·27 between the physical and corresponding mental types (see also Guilford, 1959).

TABLE III

Name *Date* *Photo No.* *Scored by*

I VISCEROTONIA . . .	II SOMATOTONIA . . .	III CEREBROTONIA . . .
( ) 1. Relaxation in posture and movement.	( ) 1. Assertiveness of posture and movement.	( ) 1. Restraint in posture and movement, tightness.
( ) 2. Love of physical comfort.	( ) 2. Love of physical adventure.	— 2. Physiological over-response.
( ) 3. Slow reaction.	( ) 3. The energetic characteristic.	( ) 3. Overly fast reactions.
— 4. Love of eating.	( ) 4. Need and enjoyment of exercise.	( ) 4. Love of privacy.
— 5. Socialization of eating.	— 5. Love of dominating, lust for power.	( ) 5. Mental over-intensity, hyperattentionality, apprehensiveness.
— 6. Pleasure in digestion.	( ) 6. Love of risk and chance.	( ) 6. Secretiveness of feeling, emotional restraint.
( ) 7. Love of polite ceremony.	( ) 7. Bold directness of manner.	( ) 7. Self-conscious motility of the eyes and face.
( ) 8. Sociophilia	( ) 8. Physical courage for combat.	( ) 8. Sociophobia.
— 9. Indiscriminate amiability.	( ) 9. Competitive aggressiveness.	( ) 9. Inhibited social address.
— 10. Greed for affection and approval.	— 10. Psychological callousness.	— 10. Resistance to habit and poor routinizing.

— 11. Orientation to people.	— 11. Claustrophobia.	— 11. Agoraphobia.
( ) 12. Evenness of emotional flow.	— 12. Ruthlessness, freedom from squeamishness.	— 12. Unpredictability of attitude.
( ) 13. Tolerance.	( ) 13. The unrestrained voice.	( ) 13. Vocal restraint and general restraint of noise.
( ) 14. Complacency.	— 14. Spartan indifference to pain.	— 14. Hypersensitivity to pain.
— 15. Deep sleep.	— 15. General noisiness	— 15. Poor sleep habits, chronic fatigue.
( ) 16. The untempered characteristic.	( ) 16. Overmaturity of appearance.	( ) 16. Youthful intentness of manner and appearance.
( ) 17. Smooth, easy communication of feeling, extraversion of viscerotonia.	— 17. Horizontal mental cleavage, extraversion of somatotonia.	— 17. Vertical mental cleavage, introversion.
— 18. Relaxation and sociophilia under alcohol.	— 18. Assertiveness and aggression under alcohol.	— 18. Resistance to alcohol, and to other depressant drugs.
— 19. Need of people when troubled.	— 19. Need of action when troubled.	— 19. Need of solitude when troubled.
— 20. Orientation towards childhood and family relationships.	— 20. Orientation towards goals and activities in youth.	— 20. Orientation toward the later periods of life.

Note: The thirty traits with parentheses constitute collectively the short form of the scale.

TABLE IV

Correlations between the primary components according to Sheldon

$n = 200$

	Viscerotonia	*Mesomorphy*	*Somatotonia*	*Ectomorphy*	*Cerebrotonia*
Endomorphy	+0·79	−0·29	−0·29	−0·41	−0·32
Viscerotonia		−0·23	−0·34	−0·40	−0·37
Mesomorphy			+0·82	−0·63	−0·58
Somatotonia				−0·53	−0·62
Ectomorphy					+0·63

(C) DO TYPES EXIST?

So these typological studies, whose results show some agreement, have succeeded where experiments on isolated traits have failed up till now; they have established somato-physic associations. Does this signify that the typological method is more appropriate in the field of personality than the psycho-metric method—as energetically claimed by Kretschmer—or should the results advanced by typologists be regarded with suspicion along the lines suggested by those who criticize the lack of precision of Kretschmer's and Sheldon's schools?

Before beginning to discuss this problem whose theoretical scope is quite considerable, it must be pointed out that the expression 'type' is used differently by different authors, by Kretschmer and by Sheldon, for example. According to the latter, each subject has a somatotype and a temperament type defined by his three-figure formula. It would be more correct to speak of 'form' in this case, but as all possible forms can be classified into three groups (according to the predominant component which serves to designate them), they are partly related to types. The component itself is not an isolated trait but a syndrome, as Kretschmer shows. The difference between Kretschmer and Sheldon may thus be reduced to a difference of technique. Sheldon specifies the criteria for belonging to different types or classes more exactly and defines the subject in relation to three dimensions, whereas Kretschmer defines the individual in relation to a characteristic prototype.

The psychometricians mainly direct their criticism towards the absence of definite criteria enabling objective judgment of the type of a person on the basis of quantitative measurements. It is true that Kretschmer also made a number of anthropometrical measurements and that psychological experiments have revealed significant differences between cycloids and schizoids. In later editions of his work, Kretschmer has given a resumé—the cyclothymic has a slower personal rhythm than the schizothymic, he is less regular in his work, he allows himself to be distracted more easily, his field of attention is wider, in colour-form tests he prefers colour and his ability to abstract in complex tasks is less. According to Kretschmer, this capacity for abstraction (*Spaltbarkeit*) is fundamental: it explains most of the mental differences between the two types.

However, all these proofs are not convincing. Kretschmer and his fellow-workers, like Sheldon, may be reproached with not sufficiently controlling the intervening variables in their different experiments. Their subjects are taken at random and it is not known whether the differences between the groups of cycloids and schizoids do not arise from their heterogeneity with regard to sex, age, education, social status, etc. To elucidate this point, Klineberg *et al.* (1934) made up groups of pyknics and leptosomes who were comparable as regards these variables and found no significant difference on the psychological level. However, this experiment may be no more conclusive than the others, since they used different psychological techniques from Kretschmer and his followers. A single experiment cannot very well invalidate a number of others where these factors are only supposed and not proved to intervene.

The typological method has another disquieting aspect from the psychometrician's point of view. The concept of type appears to imply the existence of correlations between certain traits whose grouping, as such, characterizes a type. Nevertheless, Kretschmer's school never demonstrated this experimentally and, as we have already seen in the first paragraph, these correlations are generally pretty slight. Payne (1955) in particular examined 100 subjects using eight dissociation tests, most of which had already been used in Van der Horst, Kibler and Enke's experiments. As the majority of these tests can be calculated in several different ways, 133 correlations were obtained. These were divided into a positive and a negative half with an average equal to zero, and only three values were obtained which differed from zero at a level of 0·01.

Psychometric experiments are thus fairly clearly opposed to the qualitative descriptions and daily impressions which seem to demonstrate the existence of types. According to one's preference for qualitative description or quantitative method, one would believe or deny the existence of types. In other words, we are touching here on the problem of idiographic and nomothetic methods which was raised about the study of personality, principally by Allport (1949). However good the reasons may be in favour of psychometric methods, it is premature to decide definitely against the existence of types and in favour of psychometric methods as used at present.

Indeed, the basic postulates of this latter method may not be of general value since they exclude the existence of types on principle. Psychometry requires that the relationships between traits be of a homeoscedastic nature, that is to say, that the correspondence between two traits at one of the poles (representing one of the types) is also to be found at all degrees along the scale. In this case only can the correlations be high. On the other hand, by allowing heteroscedastic relationships, low correlations would not necessarily indicate that types did not exist. The theoretical method which can account for types in the absence of correlations between the traits is obviously more complicated than the underlying method of current psychometry, but this cannot constitute a decisive argument against the existence of types. Delaporte (1945) and Cattell (1957) also proposed new methods suitable for typologies and it must be hoped that the study of types will be continued experimentally and theoretically according to the most suitable methods.

(D) OTHER TYPOLOGIES

An argument in favour of the existence of types may be the fact that several other typological distinctions proposed by various authors, under different names, seem to overlap almost exactly. We have already seen the relationship between Kretschmer's and Sheldon's types, putting forward the relationship between mental traits and somatic characteristics. However, it would be appropriate to say a few words on other typologies whose preoccupation with this relation is less apparent.[1]

In the first place, we must remember the distinction proposed by C. G. Jung (1960) between introversion and extraversion which found wide support and which seems to correspond to many people's daily experience. We shall see later that Cattell and Eysenck defined the factors determining these types; we may limit our remarks here to recalling that Rorschach (1948), by interpreting his ink-blot test, distinguishes two types of 'internal resonance' which he designates by the terms extratensive and introversive in order both to distinguish them from and connect them with Jung's types.

The interest of these latter types lies in the fact that they express the fundamental attitude of the subject towards the object. The subject may be friendly towards the object, increase his relations with it, the consequence of which is that the subject is strongly influenced by the object: this is extraversion. The introvert, on the other hand, is withdrawn from everything external, he resists instead of allowing himself to be influenced, and it is the object which must yield. According to the frame of mind of the subject—Jung concentrates on the four functions which he calls thought, emotion, sensation and intuition—the interchange between subject and object may be varied in many ways and, finally, the fundamental type is further modified by the fact that, according to Jung, the subconscious is always complementary to the conscious. Jung's types are thus defined by a really fundamental relationship which determines to the particular structure rather than by a group of inter-connected qualities. This assertion may appear surprising when Jung's very detailed descriptions are remembered, but it will be readily noted that all the traits mentioned are only illustrations of the fundamental relationship defining the type. This hypothesis was partially confirmed by factorial analysis (see p. 237) where a factor corresponding to the extraversion-introversion dimension was discovered. This is not sufficient to prove the existence of types in Kretschmer's sense of the word, but for Jung the principal question was, as we have seen, that of drawing a distinction between two basic attitudes rather than between a group of traits.

Pfahler (1929) tried to define the mental characteristics of

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[1] See works on these typologies by Rohracher (1961) and Eysenck (1960).

Kretschmer's types in normal personalities by original experimental methods. According to him, they were distinguished by the rigid or fluid nature of the mental state (*starre und fliessende Gehalte*). E. Jaensch (1929) and his disciples have gathered together a large amount of experimental data (which, however, often lack precision) supporting a distinction based on the concepts of integration and distintegration to which W. Jaensch (1926) tried to give a physiological basis. He began with the ideas of the Leipzig school (Krueger and Sander) which proposed a distinction between the syncretic and analytical types (*ganzheitlich-analytisch*) without, however, submitting it to systematic experimentation.

The relationships between these different typologies were studied in a study by Eichinger (1952). Eighty students were submitted to a large number of tests and had to complete a questionnaire. On the basis of the reports, they were successively classified in one of the types of the current German schools (Jung, Kretschmer, Jaensch: integrated-disintegrated, and Krueger-Sander: *ganzheitlich-analytisch*). In Jung's classification, the author had to choose the criteria himself; in the other typologies he was able to use the experiments proposed by the different investigators. Table V indicates the relations found between the typologies of Jung and Pfahler and the others.

TABLE V

Connexions between the classification of 80 people according to different typologies
(After Eichinger, 1952)

	Pfahler	Kretschmer	Krüger-Sander	Jaensch
Jung	41	34	29	35
Pfahler		62	65	69

The statistical values given by the author do not correspond to usual methods. For the connexion between Jung and Kretschmer, it is possible to calculate the coefficient approximately: its value, 0·45, is significant and as all other connexions except one obtained by Eichinger must be greater, a fairly clear overlap of the types studied may be assumed.

Many other typologies were proposed, but it is not necessary to consider them here since most of them have no experimental basis and they generally refer to only one aspect of personality—active and passive or emotional and unemotional, for example. They are dichotomies rather than types, and depend on certain principles which have been more or less arbitrarily selected. The most representative example is Le Senne's characterology (1945) based on Heymans and Wiersma's studies, which will be discussed later.

The typologies to which we have given most attention suggest by their agreement, even though partial, and by their biological assumptions, the existence of certain fundamental factors which may contribute to the very specific nature of personality. The theory of types is only beginning and it will be necessary to develop it further by using appropriate methods of verification.

3 Personality traits

1 The conceptual importance of the trait

The term 'trait' is preferable to that of quality or characteristic since it is more neutral. According to a widespread definition, 'personality' means the sum total of traits characterizing an individual. Le Senne (1957) defined character as 'the whole of man's congenital dispositions which form his mental framework', to which are added 'all the elements acquired during the course of life' to make up personality. In the United States, Prince (1924) gave a similar definition which had wide influence; more recently Guilford proposed this very concise formula: 'An individual's personality, then, is his unique pattern of traits'. It should be noted that these definitions are not the result of theoretical argument but simply reflect general opinion. Anyone wishing to describe personality must indicate its characteristic traits.

These very widespread definitions, although questionable, emphasize the importance of the idea of trait in the psychology of personality. Right up till today, directly observed traits constituted the raw material of the psychology of personality. This is the prime aim of questionnaires and personality inventories, and traits are quickly ascertained by studying behaviour or by tests.

The most unusual way to discover the structure of the personality is still according to Paulhan's formula (1894): 'Reduce all character traits to their simplest psychological elements and to the basic forms of the chief principles of psychology, while showing the nature of the combination which produces them.' Mounier (1947), quoting this phrase, adds: 'He takes these so-called "elements" without any appreciation of the form of the language.'

Languages, in fact, have many words which serve to characterize persons or behaviour. Allport and Odbert (1936) found about 17,000 in English, of which 4,505 designate traits properly speaking; Klages estimates there are 4,000 in German, and Baumgarten, working more stringently, 1,093. An even greater variety of human behaviour corresponds to this multitude of names. However, most of these terms are used interchangeably to signify one aspect or another of personality, sometimes by the same author without his appearing to notice. Timidity, for instance, may simply mean a certain kind of behaviour towards other people; the same term may designate a trait, a quality attributed to a person which explains why he acts timidly. In this case, certain observations lead one to deduce that the person must have this trait. However, it is possible to stray even further from the original meaning of the term by making the trait a dimension of personality. In this case each individual would occupy a fixed place on a scale ranging from the least to the most timid and this position would determine many kinds of behaviour or less general traits which often seem to have little connexion with timidity as originally meant. Finally a trait may serve to indicate a type, as with the word 'extraversion'. It should therefore be remembered that the same expression may be used at many different levels of generalization.

In order to avoid misunderstanding and give greater precision to discussions on traits and the structure of personality, it is essential to distinguish more clearly between the categories used in this field.

2 *The primary trait*

The primary trait must be conceived of as representing a direct perception of an aspect of the personality. Murphy (1947) relates how Wertheimer liked to play a series of small musical phrases on the piano, each characterizing a person present, after which they had to identify them. The number of correct identifications was considerably better than chance. This is an example of global perception of personality, while in the perception of traits, only a partial aspect is sought. It should also be remembered that even quite young children learn to use the names of traits correctly without knowing anything about psychology, except implicitly. Such learning would not be possible if these expressions did not correspond to a reality in their personal experience.

In this primary sense, the traits are *Gestalten* of a high order, preceding reflexion and psychological analysis and constituting the raw material of scientific work. This direct experience is not always of a purely perceptive nature, however, so one must distinguish between different degrees of complexity according to whether the trait indicates only what is perceived at the time of speaking or whether it is founded on extensive experience. We may have a direct impression of the attitude of someone towards us the first time we meet, or we may see that someone is afraid, uneasy, sad, gay, hesitant, etc. In these cases we grasp momentary traits of behaviour. On the other hand, when we say that someone is timid, frightened, hesitant, suspicious, emotional, etc., we are expressing the result of a number of experiences which are condensed into an overall impression. Our identification of a trait is somewhat analogous to the identification of a shape, which is the result of numerous visual stimuli. Even the psychologist accustomed to analysis usually bases his judgments on direct impression rather than on formal reasoning.

The primary trait, therefore, is the consequence of subjective experience. However, all science depends on subjective experience. For example, our perception of colours and shapes is largely used even in exact science where it is only progressively replaced by objective measurement. The subjective origin of traits is thus not an obstacle in itself to their use in scientific psychology, but their imprecision—their 'subjectivity' in the sense of 'lack of objectivity'—is likely to create difficulties.

The accuracy of a subjective description of personality cannot be verified in the same way as a sensory percept can. If in certain cases objective measurements do not correspond to the subjective impression, it would be wrong to consider the latter inexact. All that can be affirmed is that the same reality has perhaps not been perceived in both instances. This must be emphasized because too often the value of an experiment is denied in written work because it does not correspond to direct observation or vice versa, whereas in reality both are valuable in their own way and science should discriminate between them.

There is no doubt that it is impossible to dispense with primary traits despite their subjectivity. Often they creep unobserved into reasoning. To analyze the structure of personality, objective tests are used, as by Cattell and Eysenck, or so-called projective tests. In an endeavour to interpret the results, new ideas are created which have no relation to directly observable traits. In the Rorschach test, for example, reference is made to 'interior resonance' or 'aperceptive type' or concepts borrowed from general psychology, such as perseverance, frustration, aspiration level, etc.

However, in the end it is always necessary to return to traits, in their original sense. We must always bear in mind the significance of test results by comparing them with the person's real behaviour and the relation they have with their personality as it appears to us and which we describe in terms of traits. The importance attributed to the demonstration of these correlations is so great that a test is considered valid only in so far as they exist. The validation of a personality test is usually made by comparing results with independent knowledge of the personality. Herein lies what may be called the drama of personality tests: the value of these tests, validated by this method, generally seems very small, as the results in many cases do not correspond closely with the criteria used (Meili, 1958). The problem of validation is very important from a practical point of view, but even more so from the point of view of its theoretical implications. There is no doubt that the definition of traits is of considerable importance; the principal aim of these remarks on tests and their validation is to emphasize the necessity for a precise understanding of the nature of traits.

The view of a trait as a percept differs from that which treats it as a variable.

3 Traits as variables

As soon as personality was studied scientifically, it became necessary to replace subjective perceptions by objective data. A trait was thus defined as reactions or behaviour in certain situations. Questionnaires contain lists of situations in which a trait should occur. To take rigidity, in Nigniewitzky's questionnaire quoted by Brengelmann (1960), the following statements are found, among others:

> As a matter of principle you would never allow a friend to interrupt your work.
>
> Before going on a journey, you always draw up a plan well in advance and you make out a precise itinerary which you find difficult to change afterwards.
>
> You prefer safe, familiar things with no danger rather than new and unknown.
>
> You are always very annoyed if unexpected visitors penetrate your private life.

In other cases, it is possible to express the degree of a trait—punctuality or order, for example—by means of scales of judgments in which the different degrees are defined in terms of actual behaviour. With punctuality, for example, at one pole will be found over-exactness or excessive scrupulousness and at the other negligence or offhandedness.

These examples, which may be multiplied at will, elucidate two facts:

1. Starting with a trait in the primary and subjective sense of the word, behaviour supporting it is sought through personal experience or intuition;
2. Different instances of a trait are selected in order to avoid giving it too specific a meaning.

In these ways the trait which one seeks to define becomes a personality variable, a characteristic which, according to its degree, is present in or determines certain behaviour.

To measure a variable, however, does not mean simply observing its presence, but also establishing its strength. With regard to behaviour variables which are being considered here, this is done in two ways: by questionnaires, the number of responses indicating the presence of the variable under study is taken as an indication of its intensity, while with judgment scales the degree of the variable is estimated directly. Both these methods distort in characteristic ways the original trait which is being treated as a variable. In questionnaires, the number of significant responses indicates the number of occasions when the trait is revealed in a subject rather than its 'intensity'. No systematic study has been made to see if the measurements of a trait using these two methods give the same results, but observation seems to show that in certain situations a person may for example be very courageous or very rigid, and not at all in others. This very controversial question of the generality of traits will be considered later; it is sufficient here to observe that questionnaires allow only direct measurement of the probability of the appearance of a trait, which is not necessarily linked to its 'intensity'.

Measurement by judgment scales produces another distortion of the trait. It is often found to be very difficult to specify verbally the different degrees of a trait such as courage, timidity, kindness, etc. Either the probability of a trait appearing is calculated or behaviour indicated in different situations which are characteristic for each degree, with no proof that they are determined by only one variable.

After these remarks, it is hardly astonishing to find that a 'measured' trait and globally estimated trait do not often closely correspond. Subjectivity may be blamed for this and, consequently, the uncertainty of these estimates, but it is certainly more correct to conclude simply that a variable and a trait are different things. The trait is a perceived *Gestalt*, the variable is a condition of behaviour measurable in degrees. Much useless work may be avoided if this distinction is borne in mind.

Factorial analysis, which will be dealt with in the next section, is a special method for objectively isolating the fundamental variables of personality. To distinguish them from variables resulting from other methods of analysis, they will be referred to as factors. As we shall see later, Cattell considers factors as 'basic traits' which implies the existence of 'surface traits'. Here again we must draw a distinction between primary traits and variables.

4 *The trait as a generalized reaction*

Under the influence of behaviourism, a third concept of the trait has found many supporters in the United States. Watson's well-known proposition in his basic work on behaviourism expressed the view that a child could be turned into a criminal as easily as into a genius. This assertion implies the negation of determining traits from the beginning of the development of personality. The behaviourist used the word 'trait' only in the sense of a response which is found in several situations having certain common elements. In other words, a generalized response. If a certain response becomes generalized in different situations through reinforced repetition, this may be called a trait. Guthrie (1944) who expounded a theory of personality from the point of view of learning by association, gives as an example man's professional life where he is frequently faced with similar situations requiring a particular kind of response.

According to this theory the likelihood of a response becoming general is not, therefore, very great, and, consequently, general traits cannot be numerous. Indeed, an important series of studies by Hartshorne and May (1928–30) appeared to confirm this opinion. The experiments were carried out with several hundred children and concerned such traits as honesty, helpfulness, tendency to co-operate, perseverance and self-control. The children had to carry out small tasks in which these traits could be observed. They were able, for example, to cheat, to lie about what they had done, to steal small sums of money, etc., so their honesty was able to be judged. The correlations between these different actions associated with the same trait were so small (for example, 0·13 between stealing and lying to conceal cheating) that the authors rightly concluded that these traits did not exist as such.

The discussion which went on after these experiments concerning the existence or otherwise of general traits is entirely dependent on the semantic confusion surrounding the term 'trait'. Hartshorne and May have demonstrated that generalized reactions in these areas do not exist. However, one cannot conclude from this without further proof that quite different traits, such as temperament variables, cannot exist.

5 Research on traits

It is evident from what has been said so far that the structure of personality cannot be defined by means of traits, but that recourse must be made to variables, factors or similar theoretical ideas.

This does not signify that the psychology of personality should exclude traits, which remain an important subject for study.

(A) RESEARCH BY HEYMANS AND WIERSMA

These two Dutch psychologists undertook the first systematic research in the field of personality and their influence is still strong today, especially in France, through the studies of Le Senne and Berger. Heymans and Wiersma could be regarded as the forerunners of the 'factorialists' since they used statistical methods, treating a large number of facts simultaneously and trying to discover, like the 'factorialists', more fundamental qualities. However, their research is dealt with in this section because factors must not be confused with the characteristics which they investigated in their study.

These characteristics, which were examined by Le Senne (1957) (whose *Traité de Caractérologie* (Treatise on Characterology) is entirely based on the data of the Groningen psychologists) and by Berger (1950), are as follows: emotionality, activity and 'secondarity', or, as Le Senne proposed, the perseveration of nervous processes. The idea of secondary function, which was introduced into psychology by the psychiatrist Otto Gross (1902), means a process persisting in the state of a nerve-cell following a primary process. The 'secondary' process has a longer duration which, from the psychological point of view, produces a more limited but deeper consciousness as opposed to being superficial and broader. Gross established a typology on the basis of these two processes, and Jung also used them for distinguishing his various types.

Questionnaires containing 90 questions were sent to all the doctors in Holland (about 3,000) and to several other people: they were asked to reply to questions concerning all the members of a family they knew well (father, mother and children). Heymans and Wiersma's analyses were based on replies from more than 400 families (2,523 altogether). Furthermore, Heymans himself provided replies to the questionnaire based on 110 biographies. The material is therefore considerable, but undoubtedly full of errors, a fact frankly recognized by the authors themselves.

From the replies to certain questions, Heymans and Wiersma established for each subject the presence or absence of three fundamental characteristics and then calculated how many times each of the 90 traits described in the questionnaire were associated with the characteristics. However, despite this extremely rich material, the final result of their enormous effort is rather disappointing, the assembly of the traits being so complex that no intelligible order can be discerned. Only the relationship between the fundamental qualities shown in Table VI is of interest.

TABLE VI

Frequency of association of different fundamental traits according to Heymans and Wiersma

$n = 2{,}523$

	Active	*Inactive*	*Secondary*	*Primary*
Emotive	74·8%	25·2%	62·2%	37·8%
Non-emotive	73·6	26·4	73·4	26·6
	Emotional	*Unemotional*	*Secondary*	*Primary*
Active	61·5%	38·5%	74·6%	25·4%
Non-active	59·9	40·1	43·2	56·8
	Emotional	*Unemotional*	*Active*	*Inactive*
Secondary	57·1%	42·9%	83·3%	16·7%
Primary	60·1	39·9	56·4	43·6

It will be remarked that for emotional and unemotional subjects alike the distribution over the four columns is almost the same, that is to say, there are no correlations between emotionality and the two other characteristics. The same observation can be made as regards activity. In the table on secondarity, on the other hand, it will be seen that the active subjects are more frequent among the secondaries than among the primaries, and vice versa.

More recently, Gaucher and Lambert (1959) examined three groups of subjects using Berger's questionnaire (1950) based on the Dutch typology, and they submitted the results to factorial analysis which showed: (1) that the three qualities appear as factors, and (2) that the activity factor is not independent of secondarity or emotionality. This agreement, with one exception, indicates that the Dutch psychologists had selected their fundamental qualities carefully and these therefore merit closer study.

(B) ISOLATED TRAITS

In characterological literature care has always been taken to describe and analyze traits by showing their different aspects, their variations in their relations with each other and the environmental situation of the individual. Theophrastus's 'Characters' and the work of La Bruyère are classical instances of such preoccupations. Their authors often show proof of keen powers of observation and a profound and delicate psychological intuition which the modern scientific psychologist would be wrong to neglect; he will find there an opportunity to exercise his observation and gain subjects for psychological investigation.

There are numerous studies on particular traits of personality in modern experimental psychology. As we have just seen, Heymans and Wiersma hoped to be able to consider all the traits together and then extricate the most fundamental; factorial analysis, using perfected methods, has the same aim; however, the research we are now considering has a much more limited purpose, and strives to explore and define as completely and precisely as possible certain traits or variables of personality considered particularly important, either from the practical or the theoretical point of view.

Such research is carried out principally by the correlation method with a view to establishing the incidence of a particular variable on other traits or on particular forms of behaviour, as well as to examine its connexion with particular environmental factors. As we advance in knowledge, the qualities studied resemble classical traits of characterology less and become more like dynamic personality variables. This transition brings with it the need for prior theoretical assumptions and certainly these studies do reflect the different currents of modern psychology from which they spring (behaviourism, psycho-analysis, *Gestalt* psychology).

Because of the divergent basic concept on which they depend, these studies do not result in coherent views on the structure of personality, but throw some light on particular points and enable a closer study to be made of the inter-relationship between the variables. One of the principal difficulties is the operational definition of variables which tends to reduce them to a particular instance of behaviour or a response to a questionnaire; at the outset, therefore, they lose their general character which they should theoretically have. This is reflected in the results by the fact that correlations obtained are generally small, often inconsistent and, consequently, difficult to interpret. For this reason we will draw attention only briefly to some of the traits more generally studied in order to give some idea of the direction taken by research.

A) *Personal style.* Topologists have already remarked that people differ in their characteristic ways of perceiving and thinking, and they tried to formulate appropriate tests. Rorschach with his ink-blot test and Wartegg with his drawing-completion test (1953, see also Biedma, 1955) were similar in this respect. Without theorizing as to their origin, certain formal characteristics are thought to be present in many different actions performed by an individual, and for the last few years these groups of traits have been referred to as 'personal style'. Probably the most frequently studied trait is 'rigidity', the tendency to maintain principles, attitudes, ways of thinking or incapacity to change a point of view, to reconstruct forms, etc. (see Oléron's report on this work, 1955). In Adorno, Frenkel-Brunswik *et al.*'s study on the authoritarian personality (1950) rigidity plays an important role, but it does not seem that different forms of this trait can be attributed to one and the same cause, the correlations between the different measurements often being very small; as will be seen later, there is no factor of rigidity. Even if the idea of a trait of general rigidity must be abandoned, it cannot be denied that certain people are characterized by strong rigidity in certain ways. In this connexion, Sarbin's hypothesis (1954) must be noted, according to which the incapacity to change roles is due to fixation at a lower stage of ego development. This hypothesis may be used to interpret Mathews, Hardyck and Sarbin's research on adaptation to different exigencies arising in cognitive tasks (1953).

Other similar traits, such as *suggestibility*, *persistence* and *perseveration* (which latter appears to be one form of rigidity) have preoccupied psychologists. Eysenck (1960) made a resumé of the principal work carried out on these traits. Work on other perceptual variables that seemed linked to personality traits are to be found in Blake and Ramsey's *Perception: an approach to personality* (1951). Frenkel-Brunswik (1949) discovered that it was possible to distinguish individuals by the ease with which they could admit that something can be both good and bad, or that one can love and hate someone at the same time; in perceptial experiments, corresponding individual differences seemed to exist. After a series of studies whose results tended to support this hypothesis, doubts emerged as to the generality of such a variable; Kenny and Ginsberg (1958) found only seven significant correlations out of 66 measurements of intolerance of ambiguity. Another variable of personal style, *field-dependency*, seems to have met the same fate. Witkin *et al.* (1954) studied individual differences regarding the extent of the influence exercised on the figure by the background, and demonstrated the effects of this variable on personality.

Linton (1955) found correlations between certain perceptual phenomena and conformity in other fields, but reached the conclusion that conformist behaviour does not depend on one single variable. However, it was not always possible to confirm these results (see Franks, 1956); Gruen (1957) published a general criticism of these works.

Many other studies could be quoted, but we will mention only Klein (1959), who drew his inspiration from psychoanalysis, Gardener *et al.* (1959), who studied the individual constants in the cognitive field, and Kragh (1955), who proposed a model of personality based on the study of the origins of actual perception (*aktual-genetische Methode*). These few indications show that research continued ceaselessly in the study of the relation between cognitive processes and personality traits, but that it is not free from controversy. These studies will certainly help to throw light on the problem of the structure of personality, even if they do not lead to a definition of general traits.

B) *Motivational traits*. Since motivation will be discussed in another chapter, only widely studied traits will be mentioned here. It is not surprising that *anxiety* has been the subject of many studies which have been influenced by the construction of a personality scale of 'manifest anxiety' by Janet Taylor (1933). To my knowledge, there is no overall survey of experimental data on anxiety. Anxiety is generally conceived in the psychoanalytic way as the effect of internal conflict, but the problem of how far there is a tendency towards this kind of response has never been studied. The genetic studies by Meili (1957) and Pulver (1959) may perhaps be considered a step in this direction (see also

p. 247). On the basis of experimental research, de Castro (1958) proposed a bifactorial theory of anxiety according to which uncertainty is one of the decisive factors; this brings us back to the question of ambiguity referred to above.

Aggressiveness is another trait which has been the subject of much research. Since Dollard, Doob, Miller, Mowrer and Sears' publication (1939), the idea of aggression as a reaction to frustration has made it a widely accepted trait. However, the psychoanalytical theory which emphasizes the driving force of aggression should not be overlooked, as Buss shows in his recent work (1961) in which he gives an overall view of the whole question. Mandel (1960) discovered by a factorial analysis of numerous direct observations of aggressive behaviour among schoolchildren that there are four factors, of which the desire to dominate plays an important role; this approximates to the point of view of Piéron (1959) who associated aggressive drive with dominance.

The fact that different individuals respond to frustration with different degrees of aggression led to the idea of *tolerance of frustration*. This trait, which was principally studied by Rosenzweig's frustration test (1954), is generally considered in connexion with the psychology of the ego, but as individual differences regarding tolerance to *stress* in general seem to exist, the possibility of a physiological origin must also be considered. The influence of frustration on the personality of physically handicapped people has been shown by Van Roy (1954) using Rosenzweig's test, and it was studied by Kramer (1959) among different professional groups, particularly pilots and soldiers.

Inspired by Lewin, Hoppe's studied on the effect of success and failure led to the idea of the *level of aspiration* which will be dealt with in more detail later (p. 266).

In the early days of characterology, behaviour traits such as honesty, order, dominance, initiative and other attitudes were considered of prime importance, as Allport noted in his publication (1937), which may be considered the turning point in this subject. However, the traits we have been discussing have a different orientation. They are not only behavioural qualities used substantively, but qualities of mental processes. It is, therefore, quite correct to speak of progress, while admitting that revealing relationships between these qualities and behaviour have not yet been discovered.

Richard Meili

4 Factorial analysis of personality

As soon as it was recognized that observed traits do not correspond to isolated psychological entities but are only aspects of personality or behaviour, it became essential to discover the fundamental variables between and underlying traits. Heymans and Wiersma, as well as other later workers, tried to resolve this problem, but these studies always remained fragmentary and their results relied too much on preliminary hypotheses and on a choice of traits determined according to personal bias. Factorial analysis, developed in the field of aptitudes, seems to be able to remedy these faults and for almost twenty years it has been widely applied in the field of personality in order to discover the qualities which are fundamental. After the first encouraging results obtained by Spearman in the field of intellectual aptitudes, one of his disciples, Webb (1915), applied the factorial method to the analysis of character traits and found, in addition to Spearman's *g* factor, another factor which he interpreted as 'consistency of action resulting from deliberate volition or will' which he designated by the letter *w*. However, it was only after the introduction of Thurstone's multifactorial method that work in the field of personality increased. In an overall review, French (1953) quoted 109 works appearing between 1931 and 1953. R. B. Cattell, J. P. Guilford and H. J. Eysenck made the greatest and most systematic contributions to this research, R. B. Cattell expounding the principles, particularly in his latest work (1957).

A few general principles will be given first, followed by the principal results and some discussion on their value.

1 *Factorial method*

(A) ANALYSED DATA

The factorial method consists of the mathematical analysis of the correlations between a group of data. The first methodological problem which arises is that of analysed data. By what method may the quantitative facts that are certain to supply fundamental factors of personality be found? While it is reasonable to think that most aspects of intelligence can be assessed by tests, it is obvious that this is not the case with personality. Everyone agrees that direct observation must be used, although it is always difficult to put into practice and can be applied only to very limited fields of behaviour. In addition, it does not give very accurate information because of the great variation in observable behaviour. Up till now, factorial research has used three categories of data: (1) What Cattell calls the *L-data*, i.e. the 'life history' collected principally by the judgment scale method in which the observer has to indicate if the subject possesses certain traits. These data are influenced by the selection of traits, by the observer's judgment and by his understanding of the terms used; (2) questionnaires and inventories to which the subjects reply themselves; and (3) to a lesser extent objective tests or experiments.

(B) THE INVENTORY OF TRAITS

Cattell, like Eysenck, sought a broad basis for his work. Adopting the hypothesis that current vocabulary reflects fairly accurately all aspects of personality, he started with Allport and Odbert's research which has already been referred to (p. 212). Taking into account all the terms 'which an average user of the language would consider synonymous', Cattell reduced the already-selected list of 4,505 words to 160 which he considered as a sort of Basic English for the complete description of personality. To complete this, he added 11 scientific expressions, thus reaching a total of 171 'descriptive variables'. By different methods, which are not given in great detail but which consist partly of calculating correlations and partly of subjective judgments of similarity, Cattell established 42 *clusters* of traits closely linked together, which defined 'surface traits'. To simplify this explanation, these clusters may be compared with intelligence tests; the traits making up the clusters corresponding to test items. Instead of having to analyse at least 4,505 traits, for which names exist, or an even greater number of terms for behaviour, research can be concentrated on these surface traits without in Cattell's opinion losing any of its general value. It seems, however, that this manner of determining clusters renders the psychological significance of surface traits extremely complex, and this does not make factorial analysis any easier. To give a more concrete idea of the universe of traits at the basis of his analyses, Cattell's list is as follows:

Cattell's List of surface traits

1. Self assertive—submissive.
2. Intelligent, analytical—unimaginative, stupid.
3. Wise, mature, polished—dependent, silly, incoherent.
4. Changeable, frivolous—thoughtful, stoical, reserved.
5. Neurotic—not generally neurotic.
6. Hard, cynical—gentle.
7. Wilful, egotistic—mild, self-effacing, tolerant.
8. Rigid, tyrannical, vindictive—adaptable, friendly.
9. Surly, hard—good-natured, easy-going.
10. Demoralized, self-centred—realistic.
11. Strong-willed, conscientious—indolent, incoherent, impulsive.
12. Intellectual—simple, undisciplined mind.
13. Insecure, infantile,—mature, tactful.
14. Anti-social, schizoid—outgoing, idealistic, co-operative.
15. Cheerful, enthusiastic, witty—unhappy, frustrated, dour.
16. Active, unstable—self-controlled, rigid, conventional.
17. Character neurosis, psychopathic—emotionally mature.
18. Hypersensitive, expressive—phlegmatic.
19. Spiteful, tightfisted—natural, friendly, open.
20. General emotionality (maladjusted)—unemotional.
21. Ascendant, expressive, widely interested—retiring, quiet, narrow.
22. Responsive, genial, sentimental—aloof, cold, misanthropic.
23. Facile, foppish, affected—inarticulate, natural.
24. Hostile, paranoid—trusting, good-tempered.
25. Aesthetic interests, independent mind.
26. Restless, emotional, hypomanic—calm, self-effacing, patient.
27. Infantile, self-centred—emotionally mature, tolerant of frustration.
28. Changeable, characterless, unrealistic—stable, integrated character.
29. Psychophysically vigorous, alert—neurasthenic.
30. Enterprising, energetic—generally inhibited, timid.
31. Sociable, hearty—seclusive, shy.
32. Melancholic.
33. Tough, solid—introspective, sensitive, scared.
34. Imaginative, introspective, constructive—set, thrifty.
35. Clever, assertive—simple-hearted, meek.

N.B.—This list taken from Cattell (1946, p. 295) is not the only list of surface traits published by this author. It is reproduced here to illustrate the nature of the variables used in factorial analyses.

(c) IDENTIFICATION OF FACTORS

In principle, factorial analysis should consist of all these traits in order to discover truly fundamental factors. Any select choice risks emphasizing particular factors peculiar to groups of traits studied or suggesting interpretations of factors which are too dependent on the facts under analysis. However, even with the most modern methods of calculation, it is scarcely possible to encompass more than 40–50 variables in one study and very often experimental conditions make it necessary to deal with fewer. All factorial analyses are, therefore, fragmentary and the factors obtained cannot be considered as definitive.

Another important problem in factorial method is the comparison of factors obtained from different studies. To facilitate this comparison, groups of partly overlapping variables are used, but even then it is always difficult to identify the factors revealed in different analyses, principally because the results may be influenced by differences in the populations examined. Cattell drew up rules and proposed methods for facilitating this process of identification and rendering it more objective. To illustrate the degree of similarity or dissimilarity between the results in different studies, Table VII gives the loading in the 'cyclothymic-schizothymic' factor of different traits obtained in four studies.

TABLE VII

Loading of different traits in the 'Cyclothymic-Schizothymic' factor obtained in four studies
(After Cattell, 1957, Table 3–1)

Name of trait	*Loading in study*			
	1	*2*	*3*	*4*
Ready to co-operate—obstructive	0·49	0·55	0·49	0·17
Emotionally stable—changeable	0·23	0·08	−0·01	0·01
Suspicious—trusting	0·01	−0·43	−0·41	−0·34
Rigid—adaptable	−0·29	−0·20	−0·46	−0·40
Frank, expressive—secretive, reserved	0·06	−0·03	0·34	0·31

The figures in this table are typical of results obtained in this kind of comparison. It will be observed that loadings of a trait in the factor in question never coincide exactly, but their variation remains within certain limits and there are always two or three studies with close factor loading. As there are no significance tests for loadings, there will always be some doubt as to the identity of the factors derived from different analyses.

(D) OTHER PROCEDURES

Two other methods of factorial research may be mentioned. Guilford began his studies in this field with the construction of a questionnaire based on the distinction between introverti and extraverti and submitted the correlations between 36 questions to factorial analysis, which revealed the existence of four factors. In a later series of research, he tried to specify their nature, but other factors appeared and these we shall consider later.

Eysenck (1947) started with a very wide study of the whole personality, using psychiatric material on 700 neurotic soldiers. Part of the data relates to social facts (age, profession, unemployment, family status), and the remainder concerns psychiatric symptoms. Contrary to Cattell's research, these facts are thus all clearly defined, but on the whole give a less diversified picture than the replies to Cattell's 40 surface traits. The intercorrelations between the 39 variables used were generally rather small and only four factors were found, two of which—neuroticism and extraversion-introversion—are considered of interest by Eysenck (see p. 237).

Eysenck systematically sought tests which related to each other, in other words, measurable evidence which indicates significant loadings in these factors. Far from seeking other factors, he tried to show that his own were sufficient to explain the fundamental structure of personality.

In addition to these three groups of systematic research, there are many others designed to shed light on particular problems, the results of which can be appreciated only within the framework of systems of factors comprising wider fields of personality.

The above is only an outline of the fundamental methods of factor research and does not mention particular technical procedures, such as the correlations between persons or between occasions advocated by Stephenson (1953) and particularly by

Cattell, who also designed methods for estimating the similarity of factorial clusters. What has been said, however, is sufficient to show that research cannot rapidly obtain positive and concordant results because it depends not only on infinitely variable initial facts, but also on the orientation of the research.

2 *Inventory of factors*

A considerable number of factors has now been defined in different works. In 1953 French counted approximately 400 different factors in 109 works; this may be reduced to about 200 factors if names which are almost synonymous are grouped together. French took the grouping further and obtained a list of 48 different factors, each one being found in at least two works. Guilford (1959) enumerated 55 principal factors without taking into account those related to aptitudes, and Cattell mentioned 100 in his 'Universal Index of Source Traits' (1957) which contains only those factors considered to be established with some degree of certainty. He considers this list 'imperfect' in the sense that although each factor is defined and located by two to six valid tests (variables serving to identify factors) the *interpretation* of the factors, by independent validation and study of their "natural history" is still lacking. . . .' Furthermore, he considers this list incomplete 'in the sense that nearly twice as many factors could be found experimentally to exist by a diligent worker' (1957, p. 832).

This considerable and somewhat disconcerting number of factors can be explained in several ways. The principal reason is the fact already mentioned, that the definition of the factor is strongly dependent on the variables used in the investigations and identification of factors obtained from different variables is very difficult. For example, the analysis of Cattell's inventories and questionnaires, based on his surface traits, gives almost exactly identifiable factors (although Cattell mentions them separately in his lists), but Guilford, by questionnaires using other traits and behaviour, arrives at different factors. New fields are opened with the analysis of attitudes or interests; here also the results are different according to whether professional occupations or hobbies are considered.

To give an overall view of factors, it is necessary to divide them into factors of temperament and motivational factors (*hormetic dimensions* according to Guilford, *Ergs and sentiments* according to Cattell). The area covered by Cattell's factors being larger, it is appropriate to take his list as a guide, completing it with some of the main characteristic factors of other authors. The purpose of this enumeration is to give an idea of the fundamental traits of personality as they appear in factorial analyses and it is, therefore, not necessary to be exhaustive.

(A) FACTORS OF TEMPERAMENT

Hippocrates distinguished four temperaments and this division was accepted until recent times. If the factors in the following list are compared with the ancient concepts, they will be noticed to refer to more complex behaviour and introduce hitherto unknown variations. Moreover, on this subject Cattell refers to general traits of personality. It might even be wondered whether the idea of temperament has not undergone a complete change. However, Guilford, like Cattell, considers that these factors correspond to the way actions are carried out and this definition equally applies to the current idea of temperament. Whereas the old meaning of the term referred almost exclusively to the emotional aspect of actions and the drive involved in behaviour, or its style, the content of the actions is clearly relevant to the question of factors.

The following list contains the names proposed by Cattell in his 'Universal Index of Source Traits'; where possible, the names used by French for the same factor, or other terms which might define the nature of the factor, are added. However, it must be emphasized that a factor can only be defined by the variables where a particular loading predominates and never by the use of a single denomination. This can only suggest the general nature of the factor. The factors are followed by C, F or G if they are similar to any mentioned by Cattell, French or Guilford. Q or L in brackets after C indicates that the factor was discovered by Cattell in questionnaires (Q) or *life records* (L).

This list is not complete: factors mentioned by Guilford which bear a close resemblance to those of Cattell are not included.

List of temperament factors or general traits of personality
(After Cattell, French and Guilford)

Name of factor	*Authors*		
Cyclothymia-schizothymia	C (L & Q)	F	
Emotionality-ego strength	C (L & Q)	F	
Excitability (lack of emotional maturity)	C (L)	F	G
Dominance	C (L & Q)	F	G
Surgency	C (L & Q)	F	
Persistence	C (L & Q)	F	
Parmia[1] (sociability)	C (L & Q)	F	
Premsia[1] (sensitive attitude)	C (L & Q)	F	
Comention[1] (conformity)	C (L)	F	
Protension[1] (paranoia)	C (L & Q)	F	
Autia-Praxernia[1] (eccentricity, conventionality)	C (L)	F?	
Refinement-artlessness	C (L)	F	
Timidity	C (L)		G
Radicalism-conservatism	C (Q)		
Self-sufficiency	C (L)	F	G
Confidence-feelings of inferiority			G
Tolerance-critical mind			G
Seriousness-Rhathymia (gaiety, carelessness)			G

[1] Terms invented by Cattell.

In Cattell's works several variations in the names of factors are found; thus, enumeration of the factors in the text (1957) does not correspond exactly with the tables in the appendix (pp. 830–1); we have used the latter, combining them into one list.

The 17 other factors which Cattell found in his studies with as yet unpublished tests should be added to this list. They partly overlap with those already mentioned above, but their interpretation and above all their identification are not yet sufficiently clear.

(B) SECONDARY FACTORS

Most factors in the field of personality are not independent, which means that from the mathematical point of view there are correlations between the loadings of the different factors. One must conclude that these factors are still due to other causes which are partly common to several of the so-called primary factors. A new factorial analysis must be made to find these more fundamental factors, called secondary factors. Cattell made a secondary analysis of these primary factors taken from 'life histories' and questionnaires, and found the following factors:

Secondary factors according to Cattell

Extraversion—Introversion
Anxiety—Integration or adjustment
Affective instability
Constant success—Maturity through frustration
Capacity for constitutional adaptation
Tendency towards catatonia.

Although, as Cattell himself admits, the interpretation of these factors is still very uncertain and their terminology often doubtful, two points should be remembered: (1) An extraversion-introversion factor and an anxiety factor both appear as primary factors in the objective tests. This confirms the view that primary factors based on inventories and questionnaires are strongly influenced by the vocabulary used. We shall see that these two factors play an important role in Eysenck's system. (2) The first, second and last factors may be compared with the sanguine, melancholic and choleric temperaments. This parallelism is not quite certain, but it is significant that it can at least be envisaged with regard to the secondary factors, whereas this parallel cannot be drawn from the primary factors which are too specifically defined. These few indices give some slight hope that by discovering secondary factors more fundamental ones may be reached.

(C) MOTIVATIONAL FACTORS

Factorial analysis encourages the search for all the variables necessary for describing individual differences and, in so far as it encompasses all mental qualities, it must necessarily reveal all the variables. Amongst these are to be found those indicating motivation if these vary characteristically from one individual to another, as is now widely believed. A full study of motivation will be made in a separate chapter, but it is necessary to refer very briefly here to the answers which factorial research puts forward about the nature and number of fundamental drives. Very different opinions have been offered on this subject. On the basis of psychoanalytical observation, Freud posits two fundamental drives: the instinct of life and the instinct of death, *eros* and *thanatos*, and considers all others to be derived from them. McDougall enumerates 18 fundamental drives which exist universally. Murray listed 20 needs and the same number was proposed by Piéron (1959) with quite different names. This brief reminder serves to illustrate the lack of agreement which still exists on this question. The problem will, in fact, remain very difficult to resolve as long as there is no operational criterion for the existence of a determining drive. However, even if it were possible to show the physiological bases of drives—and the more this question is studied, the more its complexity becomes evident —it would be very difficult to establish the correspondence between the sources of action and their expression in man.

Factorial analysis proposes a method for resolving this problem, which in principle is very simple: to study all man's actions and all his purposes and to establish correlations between them. The related actions and aims which are more or less coupled, as one might say, must depend on common drives or needs. Thus, from concrete and individual acts, it seems to be possible to discover fundamental drives. It is necessary to group acts associated with a common drive, which is defined by the grouping itself.

However, in practice, this course is much more laborious than it at first appears. In fact, a simple solution would require drives alone to be responsible for the association between the various actions. But it seems probable that other common factors, such as aptitudes and temperament as well as certain environmental influences, contribute to the existence of correlations between the various data. Even the terms used in the interest questionnaires, the lists of preferences, the attitude scales, etc. and the surroundings in which this information is collected, influence the final results. The most systematic studies were made by Cattell and Guilford; a list of the factors proposed by Guilford is as follows:

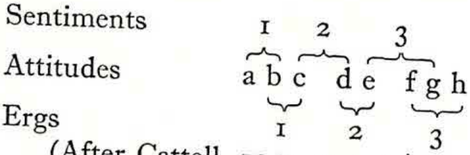
List of factors in the field of motivation according to Guilford

(A) *Factors corresponding to organic needs*
  (1) Hunger (not found in factorial research); (2) Male sex drive; (3) General activity
(B) *Environmental needs*
  (4) Pleasant, comfortable environment; (5) Meticulousness (orderly, clean); (6) Need for attention.
(C) *Achievement-need factors*
  (7) General ambition; (8) Perseverance; (9) Tenacity.

(D) *Self-determination needs*
  (10) Freedom (non-conformity); (11) Self-reliance; (12) Cultural conformity; (13) Honesty.
(E) *Social needs*
  (14) Gregariousness; (5) Benevolence; (16) Need for discipline; (17) Aggressiveness.
(F) *General interests*
  (18) Need for adventure or for security; (19) Need for distraction. (According to different kinds of intellectual interests, etc.)

Certain terms in this list clearly illustrate the difficulty referred to. It will be noticed that factors such as meticulousness, endurance, perseverance or conformity resemble some of Cattell's factors contained in his list of temperament factors.

The number of motivational factors proposed by Cattell is smaller since he worked with lists of attitudes based on certain preliminary hypotheses. At the outset Cattell wisely distinguishes between *erg* (a neutral term proposed to replace need or drive) and sentiment. *Erg* concerns the source of the attitude or interest; sentiments are defined according to objects desired and thus depend more on social and cultural models. The same *ergs* may be found in many different populations, while sentiments vary from one country to another. *Ergs* and sentiments are not completely independent but are linked in a non-equivocal way as illustrated in the following chart:



(After Cattell, 1957, p. 512.)

This type of relationship enables Cattell to enumerate the seven following 'ergs' which are related to five sentiments:

Motivational factors (according to Cattell)

List of ergs

(1) Sex erg (G 2, P 13);
(2) Gregarious erg (G 14, P 20);
(3) Protective erg (G 15, P 14);
(4) Curiosity erg (P 12);
(5) Security erg (G 18, P 16);

(6) Self-assertive erg (G 6 and 7, P 15?);
(7) Narcistic erg (G 4?, P 17?).
(The figures in brackets refer to factors in Guilford's list and in Piéron's work, 1959)

List of sentiments

(8) Career sentiment;
(9) Sports and games sentiment G 19;
(10) Religious sentiment;
(11) Mechanical sentiment;
(12) Self sentiment.

All Cattell's *erg* factors also occur in Guilford's list (for example, the need for exploration and curiosity is to be found in several different interest factors) and they also correspond to drives as enumerated by McDougall and Piéron. This agreement means that they can be considered as scientifically proved and it remains to be seen whether the other drives mentioned by these authors will be confirmed by future factorial research. However, fairly considerable divergences are observed between these results and the list of needs drawn up by Murray based mainly on psycho-analytical theory. Future research must either confirm their right to be added to the above list or show that they correspond to factors already in it. A first step in this direction was made by Cattell in some very ingenious experimental research: he constructed 55 tests on motor skill, perception, memory, intellectual activity, projection phenomena, physiological reactions, etc., which demonstrate the fundamental processes of personality adaptation, and by using special measurements differences of aptitudes are eliminated. The factorial analysis of the results obtained in these experiments leads Cattell to define the following factors (which he also calls components):

Motivational Components
(According to Cattell, 1957, p. 457)

(1) Unintegrated desires; or conscious id;
(2) Realized ego;
(3) Ideal desired self, or unrealized super ego;
(4) Subconscious or physiological component;
(5) Repressed complexes.

This list embodies all the basic concepts of psychoanalytical theory, which shows at least that there is no fundamental incompatibility between them and the concept of factors. It would, however, be premature to consider this work an experimental demonstration of psychoanalytical concept. Indeed, Cattell's interpretations appear hypothetical and the transition from such facts as 'response of diastolic blood pressure to danger', 'recollection of material relation to interests', 'memory of satisfaction obtained during action', etc. to the concept of 'realized ego' seems somewhat weak. This doubtless provides an interesting oppotunity for the study of deep-seated sources of motivation, a problem which is certainly of fundamental importance in the structure of personality.

(D) EYSENCK'S DIMENSIONS OF PERSONALITY

The preceding account of the results of factorial analysis may disappoint those who hoped by this method to discover a relatively limited list of factors clearly outlining the structure of personality. It is not, therefore, devoid of interest to note that by this same method but with a different orientation Eysenck reached what at first sight seem very different and much simpler conclusions.

It has already been said (see p. 228) that Eysenck (1947) began his research by the analysis of data on 700 neurotic soldiers. He found two principal factors: *neuroticism* and *extraversion-introversion.* Since then numerous studies and analysis of the works of other authors by Eysenck and his collaborators showed that these two factors represent fundamental dimensions of the structure of personality.

The neuroticism factor, which according to Eysenck is only the opposite of Webb's *w* factor (1915), represents a dimension along which individuals may be classified from one extreme (the very stable type of person, mature, well adapted) to the other (very neurotic person, unstable and poorly adapted), passing through the mean (normal people).

The 'extraversion-introversion' factor is bipolar and shows strong positive loading for the extravert type and strong negative loading for the introvert type. The following questions, taken from a questionnaire by Eysenck (1959) illustrate the meaning of these terms:

Eysenck's questions defining 'neuroticism' and extraversion-introversion factors

1. Neuroticism:
   - (A) Do you sometimes feel happy or unhappy without any apparent reason?
   - (B) Do you meet with ups and downs of humour without apparent cause?
   - (C) Are you frequently bad-tempered?
   - (D) Do your thoughts escape you when you try to concentrate?
   - (E) Are you often lost in thought even though people may believe you are taking part in a conversation?
   - (F) Are there times when you are full of energy and others when you feel very lazy?
2. Extraversion:
   - (G) Do you prefer to act rather than to make plans for action?
   - (H) Are you very happy when you have to do something which requires rapid action?
   - (I) Do you generally take the initiative in making new friends?
   - (J) Do you tend to be quick and definite in your actions?
   - (K) Do you believe that you are lively?
   - (L) Would you be very unhappy if you could not have numerous social contacts?

Affirmative replies correspond to neuroticism in part (1) and to extraversion in part (2).

The many indications, mostly experimental, distinguishing extraverts from introverts were collected by Eysenck (1960) in a table, of which the following is an extract:

TABLE VIII

Experimental signs distinguishing extraverts and introverts according to Eysenck

Variables	*Introverts*	*Extraverts*
Perceptual rigidity	High	Low
Persistence	High	Low
Level of aspiration	High	Low
Sociability	Weak	Strong
Rorschach	H% high	D high
Conditioning	Rapid	Slow
Figural after effects	Weak	Strong
Perceptual constancy	Weak	Strong

For some time Eysenck has endeavoured to provide a physiological basis for these dimensions, especially that of extraversion-introversion. Using Pavlov's hypotheses he contends that extravert behaviour is determined by the production of strong inhibition potentials and low excitation potentials, while that of introverts is due to the production of weak inhibition potentials and strong excitation potentials.[1] Franks's experiments (1956) verified this hypothesis.

In his experiments using tests, Cattell also defined a neuroticism factor, while an extraversion-introversion factor appeared in his secondary analysis. There is, therefore, no contradiction between the results obtained by the principal research workers (Guilford also found factors similar to those of Eysenck), and the difference in the number of factors is due to differences in the aims of the studies. Eysenck has concentrated on uncovering fundamental dimensions, and has not yet studied the chief individual differences which may still exist, whereas Cattell and Guilford are working on certain associated behaviour patterns in order to establish more general dimensions. It is interesting to note that both methods finally lead to the same results, at least partially.

3 The evaluation of factorial results

After this long, though incomplete, exposé of the principal results obtained by the factorial method, we must now try to estimate their scope in the psychology of personality. To avoid misunderstandings, we shall begin by considering the psychological significance of factors, and then the general conception of personality structure which results from this research.

(A) THE PSYCHOLOGICAL SIGNIFICANCE OF FACTORS

The first important observation is that factors should be interpreted neither as primary traits, in the sense referred to on p. 212, nor as generalized reactions, despite the terms used to designate them which often suggest primary traits. A factor is a variable or a dimension defined by data which have a strong factor loading.

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[1] The term inhibition is used here in the Pavlovian sense, that is, neurophysiological. It therefore signifies cortical inhibition associated with the absence of inhibition on the behaviour level.

One example will illustrate this: in the analysis of 'life histories', Cattell found a factor of 'source trait' which he refers to as *cyclothymia*, as distinct from *schizothymia*, in which the following surface traits have stronger loadings:

Easy-going—Obstructive, cantankerous
Adaptable—Inflexible, rigid
Warm-hearted, attentive to people—Cool, indifferent
Frank, placid—Taciturn, secretive, anxious
Emotional, expressive—Reserved
Trusting, credulous—Suspicious.
Etc.

It should be remembered that the terms used to define factors are themselves interpretations based on different observations. There are two ways, often indistinguishable in practice, of interpreting the underlying factors of a given list. The first consists in seeking the common denominator, that is to say, the type of person who possesses all or most of these qualities. The second method, which conforms more to the spirit of factorial analysis, seeks the common source of these different qualities. The direct purpose of factorial analysis is, in fact, to connect, by objective criteria, traits which must have a common source. But the definition of this source requires considerable effort to interpret and must remain for the moment purely hypothetical. These interpretations are the weak point of factorial analysis and each factor requires numerous complementary studies before it can be clearly defined. It is, moreover, curious to note that interpretations of secondary factors are generally more intelligible since they may be derived from hypotheses, whereas primary factors must be deduced from concrete and consequently imprecise psychological material.

It is, therefore, certain that the factorial results which we have presented are as yet provisional and many of the interpretations proposed may not be completely confirmed. Despite this reservation which makes a detailed discussion of each factor superfluous, certain general indications emerge from the mass of facts as to the source of factors, especially by Cattell's method.

(*a*) *Constitutional factors:* While during a certain period basic components of personality were normally considered hereditary, the dual influence of psychoanalysis and behaviourism has changed this general attitude, and today the tendency is to neglect constitutional factors and consider the formation of personality principally as being due to learning, in the widest sense of the word. Among the factors mentioned, some are constitutional, such as the 'cyclothymia-schizothymia' factor, which, according to Eysenck as well as Cattell, 'represents a temperamental characteristic in all its dynamic forms' (1957, p. 98). This also applies to the 'parmia' factor (sociability) defined by Cattell as 'the constitutional dynamic trait' having the highest hereditary determination of any (1957, p. 129). The 'protension' and 'autia' factors, certain motivational components such as the conscious ego component, the 'unconscious', or physiological component, and probably certain motivational factors or *ergs* come under this heading. However, neither Guilford nor Cattell reach a clear-cut decision on this question which continues to be difficult to solve. In certain factors of temperament ('excitability', 'dominance' and 'refinement', for example), Cattell contends there is another component which is dependent on developmental conditions in addition to heredity.

(β) *Factors determined by environment:* The overriding effects of the environment is observed in other factors influencing sentiments, in Cattell's terminology, and needs, in Guilford's. These factors demonstrate the importance of learning or habit-formation in the origins of personality. These arise from the absorption of cultural values or from imitation of various kinds of action. According to factorial research the individual qualities of behaviour, habits and needs seem to originate in this way. However, the question remains whether fundamental or constitutional factors determine the choice of assimilated cultural values. Behavioural elements defining one of these conditioned factors may have in common other factors of temperament or aptitude and could thus be defined by a particular combination of these factors; experience and the cultural environment would thus be only a superficial wrapping.

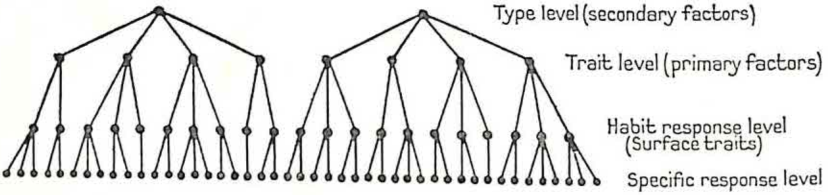
(γ) *Structural factors:* Cattell defined certain structural factors in psychoanalytical terms; reference has already been made to the 'ego strength', superego and complexes. According to Cattell's interpretation, all these factors are due to environmental action in a particular sense—not simple assimilation of our environment, but accommodation, as Piaget calls it. In this dynamic process of adjustment certain structures or schemes of action are formed. The 'ego strength' factor, for example, depends in Cattell's opinion 'largely, but not entirely . . . on environmental good fortune, in terms of family atmosphere, position in family, and freedom from trauma' (1957, p. 103). He further believes that similar environmental influence on the subject occurs, with regard to other factors not directly associated with situations stressed in psychoanalytic theory. For example, the *surgency-desurgency* factor would probably depend on punishment and deprivation. The secondary factor of 'affective instability' is understood to result from an 'overprotective or overindulgent family background' (1957, p. 319) and 'continuous success' would result from a too easy and uninterrupted success based either on one's particular talents or a fortunate start.

However hypothetical these interpretations may be, it is interesting to note that certain constellations of results or of primary factors cannot be understood without knowing the dynamic interaction between subject and environment. However, it must also be seen whether certain development conditions do not produce different effects according to the factors, and particularly those concerned with temperament. Cattell emphasizes this in regard to special factors.

One secondary factor mentioned in questionnaires and inventories does not come within the scope of the three categories mentioned. The U.I. (L and Q) II 'Anxiety versus integration or adjustment' means, according to Cattell, 'essentially the degree of dynamic integration of the total personality ego awareness, utilizing the strength of the ego'. We are not concerned here with the details of this complicated interpretation but with the fact that neither hereditary nor environmental influence seems at issue, but rather a principle of internal organization. This factor does not seem to relate to the principle so much as to its effect: anxiety, or its opposite integration; but it suggests at least the hypothesis that a tendency to integration exists, as other authors such as Goldstein (1935) and Rogers (1951) claim and which Jung also implies in his concept of individuation.

(B) THE SYSTEM OF FACTORS

The three writers to whom we owe the greater part of our knowledge in this field, and whose results have been given in the form of a resumé, agree that all the facts may be placed in hierarchical order. According to Eysenck (1960) and Guilford (1959), this order may be represented by the following diagram:



By using the terms of secondary and primary factors in place of type and trait, the schema is the same as that of Cattell's analyses, and it seems from his latest studies that the hierarchical structure is not limited to secondary factors but that at least one tertiary factor must be envisaged. The diagram above simplifies the real situation, as it must be remembered that each point on a particular level may be linked to several points on the level above, as traits or factors of the lower level have loadings in several factors.

What does this order signify? First of all, it is nothing more than a classification of traits or factors in order of generality (factorial analysis, as we have seen, used a procedure of classification comparable to those in botany and zoology). Eysenck and Guilford consider that this ordering of traits or behaviour represents the heirarchical structure of the personality, and the diagram may therefore be interpreted in two ways, as Guilford has shown. With the descriptive mode and starting from the base, the trait of the higher level is considered as the product of the traits on the lower level which are subordinate to it. In this case, hierarchy simply means that there are more or less general descriptive traits, in the primary sense of the word. If, for purposes of explanation, the diagram is to be treated as representing the internal structure of the personality and one starts at the top, a lower level fact is considered to be determined by the upper level factors. The factors are generally conceived of in this explanatory way.

Even if this hierarchical order appears feasible and even fairly adequate in the light of our present knowledge, it cannot, however, be considered as scientifically established. It is possible that it may only be the artifact of the methods used in the investigation which necessarily start with specific data in order to move in stages towards the final determinants. The intermediary factors may perhaps be only provisional theoretical construct.

Even today three kinds of factorial structure of the personality remain theoretically possible:

1. The hierarchical model which in the simplicity of its form anticipates exactly Spearman's theory of intelligence. It consists of one or even several general factors (see Eysenck) factors of groups of different degrees of generality corresponding to the intermediary levels in our diagram, and specific factors.
2. The multifactorial model, comparable to Thurstone's view of intelligence. Behaviour or primary traits would be determined by combinations of different factors whose active extent and influence may be great or small. The individual structure would be determined by the particular constellation of these factors. In the light of our present knowledge this model does not seem to be correct.
3. The different sorts of factors which we have distinguished in paragraphs α β γ suggest a third model which would consist of some factors we have called structural in addition to a certain number of general factors (factors of temperament and general aptitude).

5 The beginnings of personality

Factorial analysis is only one imperfect method of investigation, and other sources of knowledge are necessary to find a satisfactory psychological interpretation of the factors revealed. The genetic method which will be dealt with in this section may prove of great interest.

It is unnecessary to justify at any length the usefulness of developmental research in the study of personality. It is legitimate to hope that in the early stages certain characteristics of its structure will be more easily observed and the beginning of behaviour will reveal the formation of its most important elements. Our purpose is not to establish a coherent theory of the development of personality, but simply to present the somewhat sparse facts which provide clues about the structure of personality.

1 The position in the early stages

The first question, quite naturally, is at what moment does 'personality' appear, but the reply presupposes a definition or criterion of personality and, as Piaget showed in connexion with intelligence, it would be better to look for behaviour and organization from which the complete development of the latter forms of the personality could be traced. Since personality implies individuality, it may be asked from what time individual differences may be observed. However, these differences must be specified—do differences of height, weight and numerous physiological characteristics reveal differences of personality or do they foreshadow them? Obviously the question cannot be resolved *a priori* but only from observation.

In a room full of newborn babies it seems easy to distinguish many different types, and experienced nurses are able to charactize them: there are headstrong, nervous, angelic babies, pyknics, asthenics, etc. However, is this really the beginning of personality? From my own observation, these differences vanish after a few days and a more uniform group of babies appears. It would be necessary to follow the growth of these children to see if their individual characteristics reappeared at a more advanced age.

This longitudinal method appears to be the only one valid for determining individual differences in personality, and was first used by Mary Shirley (1931) in a longitudinal study covering the first two years of life. Among the numerous measurements and observations meticulously made, few showed sufficient constancy over intervals of several months, but this stability tended to increase with age. This seems to indicate that characteristic traits become increasingly fixed with age. Neilon (1948) observed 15 of Shirley's children 15 years later and drew up descriptions of their personality. She asked several people to identify these descriptions and compare them with Shirley's. The very favourable results show that at two years of age children's individuality is already quite well developed. Results by Washburn (1929) and Gesell (1929) show that it is possible to distinguish differences of temperament even in the first few months, and these remain constant for many years. Allport (1937) gives the 'portrait' of a child of four months: 'A' laughs willingly, is well adapted, extravert, capricious, active, toguish, and has a gift for languages.' Independent observers considered this portrait to be true up to nine years of age. It should be noted that such reliability observed at an early age is always in connexion with primary traits freely interpreted. Research shows that qualities relating to personality exist from the beginning of life, but they cannot be defined exactly through lack of precise methods. Escalona and Heider's extensive research (1959) comparing 31 children who were briefly examined during their first year and later re-examined more thoroughly (see L. B. Murphy, 1956) gave less favourable results: 46 per cent of the 882 predictions were correct and 20 per cent fairly correct. It should, however, be remarked that this comparison was not based on primary traits but on variables or characteristics deduced from detailed observations. Meili (1957) discovered a difference between responses to an object in children between three and four months of age; some after initial inhibition rapidly resumed a calm expression, relaxed and sometimes smiled; others remained tense, moved irritably and began to cry. Pulver (1959) showed that these characteristics remain fairly stable in different situations throughout the first year, and experiments undertaken five to eight years later (Lang, 1962) gave positive correlations of 0·53 and 0·54 between the measurements of actual behaviour and the response to an object during the first year. This reaction must therefore be based on a fundamental characteristic which, psychologically speaking, is expressed as a positive or negative attitude towards new situations. G. Meili-Dworetzki (1959) noted this taking very different forms in two brothers observed from birth until nine and thirteen years. Other similar qualities may certainly be found during the first year. Bell (1960), after a factorial analysis based on a large number of observations made during the first weeks, defined five, but future experiments will have to confirm their stability and significance in the growth of personality. So, up till now, knowledge of the early development of personality is still very rudimentary.

It seems plausible to suppose that even the first psychological differences may be associated with either physiological or external factors. Meili, Lohr and Pulver (1962) carried out studies on this by comparing observations of a child and his mother during the first ten days with the child's reactions to an object at four months. Several significant but not very high correlations were found with some characteristics of respiration, for example, or facial movements, and also with certain characteristics of the mother. These correlations are interesting but care must be exercised when extending the idea of personality beyond the evidence which allows psychological interpretation.

Compared with the numerous factors found in adults, the number of fundamental variables discovered in newborn babies remains small, probably due principally to the difficulty in perceiving typical instances. Furthermore, even fundamental variables probably reveal themselves only later, being either structural factors or behaviour which presupposes a more advanced mental level. Cattell carried his factorial analyses down to four years and affirms that 'personality structure (outside the dynamic realm) is in no radical sense simpler in childhood than in adulthood' (1957, pp. 847–8). He mentioned the following factors at the 4–5-year level: cyclothymia-schizothymia, ascendance-submission, parmiathrectia, pressure from conflict or weakness of the ego (1957), p. 848).

2 *Diversification of behaviour*

Children's behaviour, their actions and responses are very diverse, especially during the early years. One is reminded of a fan which opens gradually to reveal new facets of the child's personality. The opening of the fan of possible behaviour, in the development of perception, motor actions and intelligence, reveals the same qualities of temperament in more and more varied contexts without altering the foundation or structure of the personality. Phenomenally, the personality changes: structurally, it remains the same. Future research will verify how far this view is correct. However, in addition to these phenomenal changes, structural changes may also occur. At certain points of development, new actions may appear which cannot be explained by the development of the different functions or by simple imitation. Spitz (1957), Erikson (1950), Meili (1957) and Malrieu (1960) studied these aspects of development, and many observations will be found in Piaget's works, particularly on egocentrism. We must, therefore, consider certain structural changes in greater detail. Similarly, Sarbin (1952, 1954) distinguishes the successive formation of five sources of the 'ego' which he takes to be cognitive organizations of impressions which remain stable.

(A) THE DIVISION BETWEEN INTEROCEPTIVE AND EXTEROCEPTIVE

Most authors agree in thinking that in newborn babies there is as yet no distinction between experiences due to interoceptive or exteroceptive excitation until the age of two or three months. As Piaget says (1937, p. 356), 'the outside world therefore begins by merging with an ego which is not aware of itself, before the two elements separate into related organization'. From the emotional point of view, during this period of relative calmness, it is observed that even a sense of well-being or discomfort depends on the physical state and is not connected with external perception. Towards the fourth month the child smiles regularly at people but, at the same time, according to Meili (1957), expressions of anxiety appear. There are new reactions, responses of the subject to particular external stimuli. The agreement between observations on perception, motor development and emotional expression suggests that, during this period, interoceptive and proprioceptive experiences on the one hand and exteroceptive experiences on the other begin to be co-ordinated and differentiated. This would be the beginning of the total organization of experiences and, consequently, the organization of personality. According to Spitz (1958) the appearance of the smile signifies that at this period 'the child turns towards external perceptions and begins to let himself be guided by the principle of reality. The pre-conscious and subconscious take shape and become distinct from each other. The first traces of the ego begin to function.' This interpretation may go a little too far, making distinctions in this rudimentary organization whose effects can be seen only later. We shall never know the state of the child's consciousness at this age, but from his reactions it may be concluded that the first distinction established in the nascent personality is that linked to internal experiences, drives and desires, and also a system of experiences more independent of these subjective states.

(B) THE FORMATION OF THE EGO

We know from Piaget's studies that the formation of a system more or less corresponding to the outside world does not guarantee the perception of real objects as yet; only at 8–10 months of age does the existence search behaviour force us to recognize a more coherent and stable structuring. At the same period a well-known and characteristic emotional phenomenon appears: fear of strangers. Spitz thinks that the appearance of this fear means that the mother has become an 'object' in the psychoanalytical sense of the word, that is to say, the centre of affective needs, while until now her affective function had not been established because she was not considered as a cognitive object.

The establishment of the object in this dual sense probably indicates an important step in the origins of the personality. Indeed, it is reasonable to suppose that among the objects thus constituted, the subject himself is to be found, that is to say, a structure co-ordinating bodily sensations, the visual, tactile and proprioceptive perceptions. It is true that very few systematic observations exist on this subject, but it is known that at this age the infant begins to hit himself, feel his body, manipulate his toes, etc. (Wallon, 1934).

At the same time new behaviour towards other people appears in various forms (see Meili, 1957; Malrieu, 1960), particularly aggressive and hostile anger (Malrieu, 1960) and indignant and furious expressions (Meili, 1957). The whole range of behaviour which increases during the second year indicates that children's reactions do not depend entirely on the momentary situation: 'Emotions are no longer the simple result of actions entered upon, their approval . . . becomes part of the ego' (Malrieu, op cit., p. 146). The 'subjective' system which, after three months, begins to form and be distinguished from the 'objective' system relating to the outside world is thus consolidated and structurized further.

This system as such is more and more involved in the actions and reactions of the child, his desires, his satisfactions and his disappointments. What takes place during this period may be called the structure of the ego (Meili, 1957, p. 155). Spitz (1958) regards this period as the 'beginning of the delimitation of "self" from the surroundings, of the ego as opposed to the id and the differentiation of particular systems within the ego.'

(C) LEARNING OF RULES AND THE SUPEREGO

Finally, it may be observed that at this period the child often stops what he is doing and glances questioningly at the adult. This is most striking when the child wishes to touch a forbidden object, for example. Often this is accompanied by the child saying 'no, no' which serves to illustrate very clearly its significance. The first impulse is thus stopped by a second which, however, is not a spontaneous desire but emanates from a secondary prompting due to previous experience. These phenomena have not been fully studied until now, but it is clear that they are connected with what psychoanalysts call the superego. The processes of imitation and identification certainly play a key role when the formation of the superego begins, but accurate observations are too rare to enable one to define more exactly the connexion between this new system and those already discerned at this period. It should be remembered, however, that some of Cattell's factors are connected with the superego.

(D) ROLES, THE SEARCH FOR IDENTITY

The formation of the ego, whose first manifestations have been noted at the beginning of the second year, enters a decisive phase from about three years, which clearly reveals its complex nature. Among the new behaviour characteristic of this period are those of a sense of self-importance, shame, attempts to assert and exercise power, drawing attention to oneself and temper tantrums which are really an expression of frustrated desire. This is therefore often called the period of negativism or opposition, because the child says 'No' and resists external intervention for what might be called the satisfaction of being contrary, though what he is really doing is asserting his personality and trying to gain recognition.

Generalized opposition indicates that the concrete desire is no longer isolated but emanates from a more constant structure that cannot be manipulated by those around as easily as a passing inclination. In principle, there is nothing new when compared with the second year as the structure of the personality has not undergone fundamental changes. These facts and their frequency simply show that this structuring and centring of the subjective system which we have noted continued and the new object consisting of these internal experiences, desired, satisfactions and failures is integrated into the body-image which, according to Wallon (1934), also takes on a more consistent form during this period.

The objective system, relating to the external world, is considerably enriched and differentiated but, in contrast to what occurs in the subjective system, it does not find one focus only. It is more easily influenced by the ego centring, which produces the well-known phenomenon of egocentrism demonstrated by Piaget in the intellectual and moral fields.

All these facts suggest that substructures are formed within the subjective system. Though more clearly later on, certain aspects of the ego, desires, parts of the body and sensations are seen to be more frequently involved in the specific behaviour patterns already mentioned. However, systematic studies on this subject are lacking and all that one can say is that the boundaries within the subjective system are flexible. The concept of 'frontier' is probably incorrect in any case and the 'system of the ego' perhaps has no more frontiers than a field of gravitation.

The specific nature of this substructure is demonstrated by two further facts during this period, one of which is known as the Oedipus complex, in Freud's terminology. It is, as is well known, the affection the child feels for the parent of the opposite sex which is accompanied by a desire to destroy the other parent. Direct observation, including that of primitive civilizations, shows that the particular form of relationship between parents and between parents and children plays an important role in the formation of an 'Oedipus complex'. The very fact that relationships of a particular nature arise between the child and both parents according to his sex and position in the family show that the personality of the child is itself peculiar to him. This transformation is not only the result of the change in the libido when it enters its genital phase, as psychoanalytical theory claims; that would not explain why the family structure and the attitude of the parents is so important, as anthropologists have shown. Whatever the reason, the fact is that the child perceives the roles played by the father and mother, imitates them and identifies himself with one or the other. Since imitation is limited to what can be done spontaneously, as Piaget demonstrated (1945), it must be concluded that the formation of the child's personality has reached a stage where he can differentiate between certain roles. It is not simply a question of imitation of certain acts, for there is some selectivity in the imitation, and this choice is guided by the need for self-assertion. The child himself wants to play the role which appeals to him most. This tendency is called identification.

This interpretation of the 'Oedipus complex' might appear daring if this period of three to five or six years were not strongly dominated by imagination games and role-practice[1] which are evidently signs of this same tendency. The child expresses through play his emotional needs of the moment, and also deeper tendencies which are connected with the formation of ideals. When a little girl plays with her doll or pretends to be a nurse, and when a little boy plays at being a conductor, car-driver, policeman, etc., it is not only imitation but the exercise of a role corresponding to the image of an ideal. Even when a child imitates a locomotive, a lion or a lamb, he is presenting symbolically an aspect of his personality which seems to him desirable. The same tendency may appear in stories, drawings or dreams, and these activities and fantasies indicate that in a child of this age his actual state and ideal image are very close to each other.

Not only is the structure of personality affirmed and shaped more clearly, but selfconsciousness begins and this alone may explain the desire to be someone or something else. From this moment, a search for identity begins (Erikson, 1950), or the tendency towards consistency within the personality (Goldstein, 1934) which is nothing more than a form of equilibrium towards which all structures strive; this principle of equilibration is also to be found in intelligence (Piaget, 1947, p. 11). The difficulties experienced by the monozygotic twins in finding their identity, according to Zazzo (1960) throw light on certain conditions necessary for the formation of equilibrium. The fact that many things which appear 'external' are so similar to what is felt within makes the establishment of a coherent and stable structure much slower in twins.

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[1] We are thinking here of the role in a limited sense where the subjects acts out (subconsciously or not) and not of his actual role which depends on his position in the group.

During these three stages whose chief characteristics have been briefly described, the essential parts of the personality structure seem to be determined. It would be beyond the scope of this work to try and follow the subsequent stages till puberty where, as a result of the force of sexual maturity and detachment from the family, the structure of the subjective system undergoes quite a considerable transformation which widens and enriches the spheres of action but which does not involve a fundamental alteration in mental organization. Later still and after maturity, following the different crises which may again endanger its constantly precarious equilibrium, the personality continues to adapt.

3 *Conclusions*

Seen from the point of view of traits and factors, the development of personality may be described as a process of differentiation and integration resulting from maturation or learning. A long and often sterile discussion has demonstrated the impossibility of proving what may be attributed to one or other of these developmental agents. It is more important to specify their effects.

(A) MATURATION IN THE EVOLUTION OF THE PERSONALITY

Ancient characterology, which was not interested in developmental problems, admitted implicity that the fundamental qualities of personality are to be found in a rudimentary form from birth, but that they only appear during the process of maturation. According to this argument, education was considered to suppress or inhibit certain traits and strengthen others, but we are not clear about the exact way in which the personality would evolve solely by maturation. It may certainly be admitted that after physical, motor and intellectual growth enlarges the potentialities of action, various types of behaviour become more numerous and varied and an ever-increasing number of traits appear. In fact, when a series of films taken at short intervals during the first two years of a child's life are studied, one has the impression of seeing the same picture but with more increasing amounts of detail and subtle differentiation. However, it is obvious that this cannot be a sufficient explanation of personality development any more than Gesell's formulation when he stated that: '. . . the development of the personality depends on instinctive and innate factors . . .' (1949, p. 34). Furthermore, the idea of maturation is less a positive attempt at genetic explanation than an assertion that personality is not originally the result of learning or environmental influence. Nowadays, by factorial analysis and other research, the importance of innate dispositions appears to be clear, but it is no less clear from psychoanalytic discoveries that certain experiences and developmental conditions during the first years in particular may have a profound influence on the personality.

(B) THEORIES OF LEARNING

Once the importance of individual experience is admitted, the way in which these experiences contribute to the formation of the personality requires investigation. Behaviourists have sought to explain this by studying the laws of learning (see Chapter 12) with regard to extremely simple behaviour. Indeed, it is not difficult to show experimentally that in man as in animals simple responses may be conditioned. However, to claim from this that the formation of the whole personality rests on these laws is a step not to be taken too readily. It is difficult to explain the connexions between behaviour by these concepts. On this subject, we should bear in mind the remarks on generalized reactions and Piaget's discussion on the difficulties encountered by these theories on the intellectual plane (1959), which also apply to the present case. It may also be noted that most leading American writers such as Murray (1937) Allport (1938), Murphy (1947) and Stagner (1961) use a principle of integration of one kind or another to account for the cohesion of higher human conduct. One of the four fundamental postulates of Mowrer, who tried hard to apply the concepts of psychology of learning to the formation of personality, is that 'all living organisms tend to preserve a state of maximal *integration* or *internal consistency*' (1944, p. 69).

It therefore seems improbable that the acquisition of special or generalized habits constitutes the one and only principle of personality formation. It is interesting to note that even the most precise and biased towards motor behaviour of genetic studies do not suggest that a learning process, in the strictest sense, takes place. Rather it is the connexion between stimulus and response which is the central point of interest, while for the observer of genetic change, the striking fact is the progressive improvement or enrichment of responses. Piaget, who was satisfied neither with the explanation of maturation nor that of classical empirism, proposed a theory of schemas by which development seems to consist of structures adapting to external conditions and assimilating them.

In the field of personality, under the joint influence of psychoanalytical and gestalt theories, authors such as Allport and Sarbin (1952) developed analogous concepts. The idea that the structure of the personality grows progressively through the interchange between the external surroundings and the organization of the mind now appears to be generally accepted. It must also be noted that this is similar to the concept of *Schichtentheorie*, well known in Germany (Rothacker, 1938; Lersch, 1938), with, however, a more precise form and factual basis.

(c) THE ORGANIZATION OF THE MIND

Mental organization is fundamental to this theory and is conceived of as a system of relationships established between what one learns by experience. However, the mental content is recognized as complex, being itself determined by systems of relations. These systems are called dynamic, for to modify them by suppressing an 'element' or cancelling a relation, for example, involves the intervention of forces which are released by internal changes.

We refer to mental organization by psychological terms, but it is obvious that it has physiological roots. There are, therefore, certain advantages in considering it as a system of traces, residues of earlier processes, without the necessity or even the possibility at present of formulating precise hypotheses on the physiological nature of these traces. We have looked at the differentiation of this organization during its formation and must pursue the study of these subsystems, which may be called 'instances' by other means.

6 The instances of personality

Outside of these developmental observations psychoanalysts and then psychologists came to speak of subsystems or parts of the personality structure. A dynamic theory inevitably requires this concept as it implies the possibility of conflict between the different parts. These instances, as psychoanalysts call them, should not be confused with traits or variables, although they may appear similar in factorial analysis. They refer to parts of the total organization.

Freud formulated these structural concepts to explain the internal conflicts which produce neurotic symptoms. We must, therefore, begin with these psychoanalytic formulations in order to discuss, in the light of experimental evidence, the modifications they undergo to integrate them in a broader theoretical framework. The clearest and most detailed account of psychoanalytical theory will be found in Rapaport (1959).

1 The id and the subconscious

Freud's theories began with the discovery that hysterical symptoms have unconscious causes. Among Freud's fundamental postulates, Rapaport quotes the tenet which states that 'the crucial determinants of behaviour are unconscious' and 'all behaviour is ultimately drive determined' (1959, pp. 88 and 89). The hypothesis of a psychic region controlled by the libido and inaccessible to consciousness is thus the point of departure for psychoanalytic theory.

However, this definition of a psychical instance is not satisfactory. We know that conscious phenomena only constitute a very small part of the psyche and mental reactions are considerably influenced by unconscious conditions. 'The heart has reasons reason knows not of,' said Pascal, and most men are not aware of the true motives for their actions. However, many of these determinants may become conscious and thus not form part of what Freud calls the subconscious. Another criterion than actual experience is required to define the subconscious, a criterion which refers to something which cannot become conscious.

Freud himself wrestled with these difficulties for a long time (1915, 1923) and finally replaced these ideas by the 'ego' and 'id'. He then proposed considering how they functioned in order to distinguish their structures. The system relating to 'consciousness' would act according to the reality principle and that of the id to that of the pleasure principle. The first conforms to reality, obeying physical laws, social conventions and logic, and the second is dominated by subjective needs of a biological or emotional kind.

These definitions bring us back to the genetic observations made earlier. In fact, the child, at the beginning of his evolution, knows only the second kind of adaptation; it is only gradually that he acquires a more objective way of perceiving the world around him, and, therefore, the possibility of adapting his behaviour. What we have called the subjective system is, therefore, essentially similar to the id of psychoanalysis. It is governed by the same laws and is the source of motivation and primitive drives as well as needs and secondary interests. It is strongly influenced by the organism, particularly through drives, since the source of emotional tension is intimately connected with physiological processes. However, it would obviously be incorrect to identify the subjective system with the id or the subconscious as many affective memories and deep-seated needs, rooted in this system, may become conscious.

One other definition of the id should be mentioned: that of including in this idea a 'group of drives' (*Vocabulaire* by H. Piéron). This definition is certainly consistent with the usual use of the term, even by Freud, but it is too limited. Where would the complexes and traces of trauma and the results of repression be placed, etc.? To interpret these, neither the idea of the subconscious nor of the id, in the strict sense of the word, is sufficient.

Freud very properly remarked that it is not the biological drives as such which form part of the psychic system, but their representations, that is, the psychological contents, the actual experiences through which these drives take effect. This system of drives as a psychological reality is part of the 'subjective system' since it consists of actual experiences according to the pleasure principle. Although it is impossible to define the criteria more precisely at the moment this forms only one part. The subsystem depends most directly and strongly on biological drives, but it is not necessarily the least accessible to consciousness. Its nature will become more clear, at least in a negative sense, when we study another important substructure, the ego.

2 *The different aspects of the ego*

The concept of the ego, in the sense of an *instance of personality*, has become accepted thanks to psychoanalysis. The choice of this word for a substructure opposed to the id indicates that the phenomena which it determines are principally those with which the subject identifies himself consciously. The former significance of the term 'ego', meaning the content of actual fundamental experience, is partially interwoven with the present-day acceptance of the idea as both functional and structural. There is thus a certain excess of meaning in this notion, and in the following sections we shall distinguish the different aspects, beginning with the actual experience which is clearly the chief aspect to be considered when definining the structure of the ego.

(A) THE 'I'

W. James (1890) introduced a very useful distinction between the 'I' and the 'mine'. By the term 'I' he means the ego in the narrowest and strictest sense. The word 'I' expresses the fact that the person feels himself to be the subject of his actions, his perceptions and emotions and is aware of his continuity and identity as the same as that of the previous day. This immediate experience, which is sometimes described as exactness (Claparède (1924) asked subjects in what part of their body they located it), and which has no particular content, may be understood as the very sensation of centring in the subjective system. Observations, particularly of abnormal subjects, show that this feeling of the 'I' may be more or less clear, pronounced or diffuse. In cases of depersonalization and what is called 'Loss of ego' it may be partially absent, although certain writers like Jaspers, for example, deny that the sense of being the subject of one's actions and feelings can be completely lost. On the other hand, Koffka (1937), among others, considers it possible to have conscious experience without being aware of the ego and he supports this, quoting a description by a mountaineer of his awakening at the bottom of a glacier crevice into which he had fallen and lost consciousness. Federn (1952), the psychoanalyst who went even further into the phenomenology of the ego, cited the case of a patient saying to himself 'I am no longer myself'. This expression where the 'I' denies the 'myself' clearly illustrates the complexity of these phenomena where language habits do not always reflect actual experience accurately.

All that can be concluded from introspective accounts is that all degrees of feeling of 'I' can exist, which is compatible with the hypothesis that feeling depends on the degree of centring in the subjective system and this, in pathological cases, may be weakened or even totally absent.

(B) THE 'MINE'

For the psychology of personality, the 'mine' is much more interesting, since it concerns individual material. It deals with one of the most important aspects of the ego and it is regrettable that psychologists have not studied it more systematically. In fact, no advance has been made since James, who defined this term as what the subject considered belonged to his 'I'. Quite naturally, this comprises first of all the body; but observation shows that here differences must be noted; certain parts such as the head, the eyes, and the heart seem more closely linked to the idea of the 'mine' than, for example, the toes or the nails, and everyone knows that among small children the different parts of the body are only progressively integrated into the body-image. Federn made particular studies of what he calls the 'boundaries of the ego' among different types of mentally ill subjects. He also threw light on changes which can occur in sometimes very brief periods. However, the limits of the 'mine' do not stop at the surface of the body. Certain objects, certain persons close to us, memories, ideas, etc. may also be part of the 'mine'. The belonging of an object to the 'mine' is more clearly illustrated by the fact that we feel ourselves 'belittled' by its loss. Reactions to injury to the 'mine' would even constitute an objective criterion enabling one to determine its limits without being dependent on introspection. However, this study has not yet been undertaken. It would show without doubt, in addition to the large individual differences revealed by pathological studies, that these limits are not very precise and that the 'mine' merges into the 'non-mine' without. In contract to this, in the normal case where another person enters our field of action, the difference between the 'mine' and the 'non-mine' emerges quite clearly. The territory which an animal defends and in which it attacks may be compared with the 'mine' and illustrates certain aspects of it. The intervention of another person may in certain cases produce a contraction of the 'mine', like a diminishing of the field of action, which may bring about a feeling of lessening or belittlement.

This concept of the 'mine' has certain connexions, still to be established experimentally, with the idea of value. It may in fact be supposed that the more a person values something, the more it is part of his 'mine'. Perhaps the relation should be reversed, and the subjective hierarchy of values be said to stem from the structure of the 'mine'. It seems improbable, for example, that someone despising material values would consider his bank account as part of his 'mine', whereas a miser certainly would.

(c) THE PSYCHOANALYTIC CONCEPT OF THE EGO

For a long time, Freud considered the id, or subconscious, as the essential part of personality, and the facts just related would not have interested him. However, Freud needed an opposing force to the 'drives'. First of all he called it 'censure', and only in 1922 in *The Ego and the Id*, one of his most important psychological works, did the concept of the ego take its true place as an important *instance* of personality in psychoanalytical theory. To Freud, the 'ego' is the centre controlling conscious adaptation, of which perception, intelligence and motor behaviour are part of it. Anything which may become conscious, even though it contains an unconscious part, belongs to the ego.

This concept of the ego, while sufficient to explain the defence mechanisms against libidinous drives, is not satisfactory from the theoretical point of view. It is not only the source of cognitive and executive functions, but also has a will and aims of its own. Freud, in fact, compares the ego to a rider sitting on a horse—the drives—which he must master and direct. However, it has not yet been shown where he finds the strength to fight the id. In short, this psychoanalytical ego includes the whole personality with the exception of biological drives and it is obvious that so general a concept cannot be of much use; indeed, it conceals the problems rather than solves them.

If we are to proceed systematically, we must distinguish between the different aspects of this complex called the ego:

1. The centring of most of the functions and psychic phenomena which we mentioned when dealing with the 'I';
2. All the objects which define the 'content of the ego' or its field;
3. The 'defence mechanisms', more generally a collection of non-biological drives, first fully appreciated by Alfred Adler, which serve to defend and strengthen its sense of force and value.

On the other hand, although the cognitive and executive functions were central to Freud's concept of the ego, they have no function there. They may be instruments at the service of subjective needs, but, as we know, their development requires their liberation from all subjectivism. Hartmann, the psychoanalyst who dealt most systematically with these problems (1937), distinguished in the ego a conflicting and a neutral sphere, both determined by the cognitive functions. According to our genetic expose, they depend on the objective system, while the other phenomena contained in the concept of the ego belong to the subjective system. Its centring, as we have already said, would account for the feeling of the 'I', the definition of the 'mine' and be the source of the drives in the ego.

However, in the light of present-day knowledge we cannot speak of a system of the ego in the strict sense of the word and there is even some danger in abusing the concept of the ego, because it would then quickly become synonymous with personality and thus cease to have any precise significance. If we use the term ego, it is for the sake of convenience and to designate in one word the three aspects mentioned above, without replacing it by one instance, a personality within the personality. Allport (1958) defended a similar point of view by proposing that the theory of personality should not use the idea of the ego alone, but always specify that it refers to the consciousness of self, the image of self, the self-esteem or the expansion of the ego (p. 47, German ed.).

The experimental study of these problems is partly on the motivational level (need to affirm and defend onself).

3 *The image of self*

Another concept of the image of self must be mentioned, which seems to express the feeling of the 'I' better. An attempt was first made to demonstrate experimentally what had hitherto emerged only from clinical observation, and although the results were not very conclusive, we shall present examples of the principal studies.

A person perceives his appearance, behaviour and characteristics as he does the outside world, and these perceptions—which we have already mentioned in connexion with the growth of the body image—obviously form a more or less coherent, consistent and objective image of the whole. This *self-image* or *self-concept*, as Anglo-Saxons call it, seems an important characteristic of personality, and certain authors, such as Stagner (1961) for example, even identify it with the ego. We shall consider several aspects of this phenomenon.

(A) THE IMAGE OF ONE'S OWN APPEARANCE

Gottschaldt (1954) put the problem of the self-image in a concrete way: how does a person see himself in a mirror? To reply experimentally to this question, Gottschaldt constructed an apparatus enabling one to project wide or narrow views of a photo of the face. The subject sees in front of him his reflection in the mirror side by side with the projection of his photograph which he can vary in width by turning a button till they correspond. Table IX shows the principal results of Gottschaldt's experiments and those of one of his fellow-workers, Wiele. Gottschaldt's subjects were chiefly mono- and dizygotic twins.

The figures indicate what percentages of cases chose a too

TABLE IX

Perception of one's own face

(After Gottschaldt, 1954)

Age	*N*		*The photo considered correct was*									
			narrower				*not altered*		*wider*			
			More than 5%		*Less than 5%*				*Less than 5%*		*More than 5%*	
	G	*W*	*G*	*W*	*G*	*W*	*G*	*W*	*G*	*W*	*G*	*W*
7–11*	29	9	3·5	0	20·7	33·3	65·5	66·7	3·5	0	6·9	0
10–11	34		11·8		20·6		52·9		11·8		2·9	
12*	20	12	15	25	30	0	35	58·5	20	8·3	0	8·3
13–15	24	13	4·2	47·7	45·8	46·1	12·5	7·7	29·2	23·1	8·3	15·4
Over 17	41	13	9·8	46·2	41·4	0	12·2	7·7	34·2	30·8	2·4	15·4

* Column G refers to Gottschaldt's results, column W to Wiele's. The group went from 8–10 and from 10·4 to 12·2 in Wiele's experiments.

large, an exact or a too narrow view. Despite rather wide variations, it is clear from these experiments that differences between the real and the perceived image increase with age. Comparing this with Bruner and Postman's experiments on perceptual distortion resulting from the subject's inner needs or with projection mechanisms, the modifications of the image would depend on the internal ideal image and the desire to resemble it. As this image becomes clearer with the maturing of the personality, it is to be expected that divergencies between the real and perceived image would increase with age.

(B) SELF-ESTIMATION

Altering the perceived image appears, therefore, to indicate a desire to be different, and, consequently a lack of satisfaction with oneself. However, the degree of satisfaction with oneself, or self-esteem, appears to be very important in the behaviour and internal dynamics of a person.

An interesting and direct method for measuring self-esteem is that first used by Wolff (1943) and repeated with similar results by Huntley (1940): without the subject knowing, photographs are taken of his crossed hands, his semi-profile, a sound recording is made when he is telling a story and a specimen of his handwriting is obtained. Six months later he is shown these one after the other, together with those of other people, and is asked to give his opinion on them and to indicate at the end if he recognizes his own. Two-thirds of the material is not recognized, and Fig. 1 shows the quality attributed to the subject's own documents depending on whether he recognized them as his own or not. The highest score was attributed 162 times to unrecognized documents and only 30 times to recognized documents. However, as the number of the latter is much smaller, percentages are given.

In interpreting these very interesting results, the first fact to be noted is that any sort of estimate would show a majority of average scores with a certain asymmetry towards the positive pole. This is, in fact, what is found in this experiment on recognized material. The subjects tend to give themselves rather high marks. The totally different aspect of the curve for unrecognized documents can be explained only by admitting that the subjects regarded the material as identical to their own without realizing it, or, being particularly drawn to or repelled by it, would not admit its origin. Whatever the explanation of these facts, they show how people were biased towards appreciating their own qualities, probably because self-esteem depends on this. Using slightly different material but the same technique, Epstein (1955) found the same over-estimation of unrecognized documents but no under-estimation. The opinions of a group of schizophrenics were more favourable than those of normal people, which may be interpreted as a sign of regression towards primary narcissism.

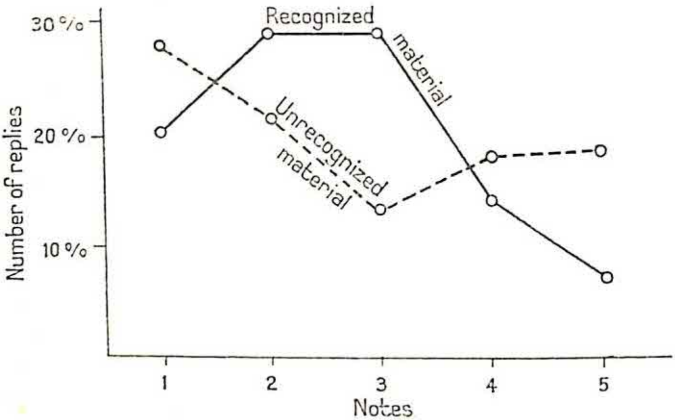

Fig. 1. Appreciation of material which is or is not recognized as one's own. (After Judgments of self based upon records of expression behaviour, *J. abnorm. soc. Psychol.*, 1940, **35**, 396–427.)

(c) THE PSYCHOLOGICAL IMAGE

Questionnaires on value scales have been used in many experiments to determine the image that a person has of himself. The subject has to indicate the qualities or behaviour and attitudes which he attributes to himself or indicate where he places himself on a scale. Up till now no attention has been paid to the details of the portrait which the subject thus traces of himself, but only to the total level of the appreciation implied in his responses. This level is established in two different ways. With the first method, the traits proposed to the subject are divided into favourable and unfavourable, as reached by general agreement, and the level of self-appreciation (*self-esteem*) is determined according to the number of favourable qualities the subject attributes to himself. The second method, based on the principle mentioned above, consists of replying to the same list of questions in two different respects: not only does the subject have to say how he sees himself (subjective image), but also what qualities he would like to possess (these constitute, therefore, an ideal image or *ideal-self*); the divergence between the two is considered a measurement of the degree of satisfaction with or acceptance of oneself. Finally, an attempt may be made to assess objectively the qualities evaluated by the subject and compare this objective image with the subjective image and the ideal-self. All these measurements are very complex and are certainly not independent of each other. The subjective image depends on the ideal self and vice versa; neither can be independent of the qualities which the subject actually possesses.

(D) THE BEGINNING OF THE SELF IMAGE

The first basic hypothesis is that the image and the estimation of oneself are strongly determined by one's degree of success, parental attitudes and other experiences during childhood. Several studies have been made into these problems. Using lists of traits, Helper (1955) asked 50 young boys and girls to describe their self-image and their ideal-self: their parents were required to describe their self-image, the image of their partners and their children, as well as their own ideal-self and those they wished their children to have. However, the connexions between these data only partly confirmed the hypotheses expressed and the influence of parental attitudes could not be clearly demonstrated. At first sight, the results of research by Jourard and Remy (1955) seem more positive. They measured the degree of satisfaction felt by their subjects with regard to their physical appearance and more generally their own personal image; they asked them to specify what they imagined their parents thought of these qualities. This experiment showed: (1) that satisfaction with one's physical appearance is highly correlated with satisfaction about one's mental qualities (0·68 for men, 0·84 for women), and (2) that the subjects' estimations correlate positively with those they felt their parents would have given (r between 0·56 and 0·77). These results, therefore, appear to indicate that the subjects model their self-image on what they think their parents feel about them.

According to certain theories the success and failure one encounters is particularly important for the development of one's self-image. However, this has not been clearly demonstrated. In Coopersmith's experiment (1959), these subjects (children of 10–12 years) who, from their replies to a questionnaire, appeared to have a lower estimate of themselves than that of their teacher, had better results in a school test and were more frequently chosen as friends than those who showed the opposite tendency in the questionnaire (that is to say, who had a higher self-appreciation than that of the teacher). These results are therefore the reverse of the usual hypothesis. This, however, is proved to be the case in a comparison of children who, in their own and teachers' opinion, appear to have a poor self-image: these children do worse at schoolwork and occupy a lower sociometric position. It seems from these results, therefore, that success or failure is not necessarily reflected in self-estimation and that there are cases where under-estimation exists despite positive experiences and without it being apparent to the teachers. Success and failure appear to have a different effect according to the different subjects (see also p. 267) and this leads one to the hypothesis that their influence varies according to one's self-estimation. This is a reversal of the causal relationship.

4 Levels of aspiration and expectation

The image of self and the ideal-self must affect behaviour in the claims a person makes on himself. Basing his work on Lewin's theories, his collaborator Hoppe studied subjects' reactions to success and failure (1930). To estimate these, he introduced a new concept, that of the level of aspiration, which embodies the aspects of the ego just referred to. Frank (1938) and Lewin himself with his collaborators (1944) demonstrated the significance of this variable. One will find in the work of Nuttin (1953) and Robaye (1956), a summary of many studies carried out on this problem, particularly in the United States. These experiments led Robaye to distinguish between the level of expectation and the level of aspiration: the first is defined by the level the subject thinks he can reach and it is this and not the level of aspiration which is measured in experiments where the subject has to indicate the degree of success he expects. The level of expectation depends on the confidence which the subject has in his capacities in the field in question, and also on a certain amount of general confidence. There is certainly a connexion, therefore, with the measurement of self-esteem referred to above. According to Robaye, on the other hand, the level of aspiration is connected with activities in which the subject feels personal obligation; to use James's terminology, it might be said that the level of aspiration is connected with objects belonging to the 'mine' category. Further, it seems that the level of aspiration concerns the self-ideal since it is connected with aims which the subject wants to reach in order to satisfy himself.

Robaye's data on the influence of family position on levels of expectation and aspiration may, therefore, throw some light on how self-estimation and the ideal-self originate. Robaye examined 30 girls of 18–20 years, all students in domestic science college. As will be seen, there was no correlation between the two levels into which the group is divided.

Biographical analysis and examination using projective tests leads the author to make the following statements:

'The non-frustrated child, loved and brought up tolerantly and developing towards balanced maturity has a high level of *expectation* and a *moderate* level of *aspiration*.

'The overprotected child, loved, but kept dependent, has a *low* level of *expectation* and a *moderate* level of *aspiration*.

TABLE X

Distribution of levels of aspiration and expectation
(After Robaye, 1956)

Level of aspiration	*Level of expectation*		
	High	*Low*	TOTAL
High	9	8	17
Low	6	7	13
TOTAL	15	15	30

'The child brought up rigidly, loved up to a certain point, living in a fixed framework of punishment and reward, can reorientate his drives towards permitted alternatives and has a *high* level of *expectation* and a *high* level of *aspiration*.

'The prematurely and capriciously frustrated child has a *low* level of *expectation* and a *high* level of *aspiration*, usually unrealizable' (p. 198).

One type of family influence may therefore harmonize the two levels, whereas another may lead to dissociation, lowering one of the levels and raising the other. On the other hand, the author does not consider the possible influence of constitutional variables which quite possibly are also important. If Robaye's conclusions cannot yet be considered definitive, they nevertheless give the most coherent view at present on the relations between the two levels—and, consequently, on the self-image and the ideal-self—and their dependence on early influences.

5 Equilibrium and the strength of the ego

The idea that too great dissonance between the person's image of himself and the image he would like to have creates internal conflicts is widely accepted in many studies. Using the above method, Block and Thomas (1955), among others, determined the self-image and ideal-self of 54 subjects. The correlations between the two estimations varied between $-0{\cdot}30$ and $0{\cdot}84$ with an average of $0{\cdot}64$, confirming the fact that a certain divergence is normal but that it remains fairly limited in most cases. The degree of agreement between the two images was, in turn, correlated with the results on different scales of the M.M.P.I. (1951). These scales indicate the degree to which one belongs to different clinical groups, and the higher the quota on one of these scales, the more the person can be considered abnormal and maladjusted. Five of the nine principal scales (hypochondria, depression, psychopathy, psychasthenia and schizophrenia) give negative correlations with a high degree of agreement between the two images thus verifying the present hypothesis, at least in so far as the results of the M.M.P.I. may be considered valid.

Rogers (1954) explained the reasons for the divergencies between the two images among neurotics in psychoanalytic terms and demonstrated that they decrease during psychotherapy, particularly as a result of modifying the self-image. Taylor (1955), on the other hand, showed that without psychotherapy and solely by measuring the self-image repeatedly, it tends to become more positive, consistent and similar to the self-ideal. These modifications are, however, smaller than those found during therapy, where the difference between the two images is greater at the outset than with Taylor's subjects.

The difference between the self-image and the ideal-self is not the sole source of lack of equilibrium in the personality. Just as conflict between divergent needs produces emotional tension, so the existence of two or more strong but incompatible tendencies in a person may destroy the equilibrium necessary for normal adaptation. Trehub (1959) speaks of *ego-disjunction* in these cases and shows that in a group of schizophrenics it is significantly greater on the average than among adolescents, students, neurotics and persons with behaviour problems. Among students it is higher than among adolescents (average: 15·6 years).

The idea of ego-strength is frequently used in relation to these measurements of internal equilibrium or cohesion. The ego being, according to psychoanalytic theory, the instance responsible for adaptation to reality, its 'strength' or 'weakness' determines whether correct adaptation will be greater or smaller. The task of the therapist is often regarded as the strengthening of the ego, either to increase the influence of basic drives or of the superego. Barron (1953) proposed a scale of ego-strength which includes questions on the absence of worry, the degree of self-confidence and tolerance towards other people; Cattell's 'strength of the ego' factor is defined by absence of infantilism, worry, anxiety, depression, unrealistic thoughts and perceptual distortions. Groups of abnormal subjects used for the validation of the scales in such a way that this ego-strength means nothing more than adapted behaviour and it has not yet been possible to give it a more precise meaning. In view of the complexity and multiplicity of the phenomena connected with the ego, the idea of the 'strength of the ego' cannot have a precise scientific significance. It must be replaced by defining the different forms of structural deficiencies.

6 *Sociably desirable qualities*

Research on self-esteem, some examples of which have been given, implies that each person has at least a self-image and an ideal-image and that their degree of harmony constitutes an important characteristic of personality. However, according to certain writers, the results of these studies should be interpreted differently. Edwards and Horst (1953) seem to have been the first to enquire whether the responses in these studies were not influenced by collective norms and by a tendency to attribute favourable qualities to oneself and to make one's ideal conform to these norms. They therefore sought to determine what they called *social desirability* in a group of subjects that is, the degree to which they desired others to possess a certain trait, and they established a correlation between the probability with which the subjects attributed these traits to themselves and their 'desirability'. The influence of desirability was to be expected, but it is nevertheless surprising that this correlation reaches 0·87. These results have since been confirmed and Edwards (1957) made a scale of *social desirability* from the M.M.P.I. From the results of different studies, the ideal image has roughly the same degree of relationship with 'social desirability' as the real image, the two correlations being generally more than 0·80, but the correspondence between self-appreciation and social image may vary considerably for each individual. According to Kenny (1956) there are subjects who, in one or both of these images, closely conform to the norm and others who deviate widely from it.

These facts show that the agreement between the two images of the self, which is considered as an index of self-esteem, may be due to conformity to social norms. However, as these norms are not strictly laid down but vary according to the individual's perception of them, interpreting the results becomes very difficult. From experiments on 'social desirability' it may be supposed that the divergence between the two images of the self comes from one of them deviating more strongly than the other from the norm. In particular, one might suppose that a tendency towards self-depreciation would be the principal reason for disagreement between the self-image and the ideal-self. Certain facts appear to show that similar disagreements occur in assessing other data. Lévy (1956) asked a group of subjects to give their personal and ideal images of themselves and also their native town. The degree of disagreement was the same for both comparisons. The Q-correlations varied between 0·08 and 0·82 for the personal images and −0·28 and 0·92 for the home town images; the correlation between the two series of coefficients was 0·70, which shows that the subjects have a fairly constant tendency to deprecate the real image, whether of their town or themselves.

Experimental facts are too few to permit a conclusion, but what there are indicate the need for caution when considering that such concepts as self-image and ideal-self designate realities which can play a part in dynamic interaction. It must always be remembered that in these studies the subjects are appreciating particular traits and the 'self-image' is already a theoretical construction. It is possible that the underlying reality consists of a more or less positive global feeling and a level of aspiration which may be high or low.

7 *Ideal-self and superego*

The superego is, according to psychoanalytic concepts, an instance 'whose unconscious function is to encourage the ego, in order to avoid guilt, to defend itself against instinctive drives emanating from the id' (*Vocabulaire* by H. Piéron). Being very difficult to define operationally, experimental research has not been attempted. The ideal image has more or less taken its place since it seems easier to grasp and, it can fulfil a similar function of exercising certain controlling and selective influence on behaviour as the superego does. In conformity with psychoanalytic theory, identification with one's parents is also considered responsible for the origin of the ideal-self and, as we have already shown (p. 265), this hypothesis has been at least partially verified. However, it would certainly be wrong not to distinguish between the two concepts and to disregard the very important differences between them. This more or less unrealistic ideal-self which everyone cherishes is far from being the tyrant the superego sometimes is. The superego is repressive and is at the root of guilt feelings, while the ideal image attaches value to certain acts rather than others; it may have an effect on intentions rather than on actions, and it is well known that the road to hell is paved with good intentions. This conception of the ideal-self may be assimilated to what Adler calls aim or life plan. These different problems cannot yet be treated experimentally and these few remarks are intended only as a warning against a too hasty identification of the two notions.

8 *General conclusions*

The concluding remarks in this section on the dynamic structure of the personality will review all the facts given in the chapter. Indeed, in some ways dynamic structure synthesises all the factors determining personality; all studies about personality must finally contribute to the knowledge of its dynamic structure.

In the different sections of this chapter, we have examined three different models of personality; the typological model (II), the factorial and dimensional model (III and IV) and the dynamic model (V and VI). Needless to say, these concepts should not be taken in too absolute a sense, as each of them possesses certain of the others' qualities. The distinctions only refer, therefore, to the dominant characteristic.

Typologies start in principle from the global perception of the personality by reducing the multiplicity of individual forms of a few clusters grouped round a representative type. This preparatory work of description and classification must be followed by an explanation of the reason for this grouping and definition of the variables which account for the peculiarities of each type. Kretschmer and Sheldon introduce constitutional factors without being able to demonstrate them up till now. Jung also founds his distinction between extravert and introvert personality on a physiological factor, but envisages their formation dynamically, thus agreeing with psychoanalytic theory on many points. Although the result of typological efforts is perhaps not as negative as certain psychometricians believe, it is certain, however, that this theory has not up till now been able to present a clear picture of the structure of the personality.

In its origin, factory theory resembles the old model of personality by treating it as a collection of innate qualities; its method of investigation is intended to reveal basic dimensions objectively. However, the results of these efforts have gone beyond this basic conception. On the one hand, Guilford and particularly Eysenck represent the typological point of view as discovering a hierarchy of factors; on the other hand, Cattell was forced to introduce concepts of psychological dynamism to explain certain of his factors. However incomplete, provisional and, in certain respects, disconcerting these results may be, they show that the structure of personality is based on certain constitutional dimensions and also that it is influenced by the two other main principles which any complete theory of personality must take account of.

The typological and factorial theories are static in concept as types and factors only serving to describe the form of the personality. Dynamic theory on the other hand starts from the idea of forces whose interaction between themselves and external conditions creates the structure of the personality. This theory, in its modern form, is of psychoanalytic origin, but is elaborated on a wider basis through the work of Murray (1937), Mowrer (1944), Nuttin (1955) and others. Influenced by *Gestalt* theory, Lewin (1935) elaborated dynamic concepts independently of psychoanalysis which inspired Tolman to make a more systematic attempt (1952). The most complete synthesis of present-day psychological knowledge was made from a dynamic point of view by Murphy (1947). None of these theories, however, furnishes variables that can easily be tested experimentally and they are not conceived with differential psychology in mind. Research trying to translate these concepts into hypotheses which can be verified experimentally (characteristic examples of which appear in Part VI) give far from satisfactory results. We will refrain from concluding that the underlying theories are mistaken or that experimentation in a field where the individual is considered very specifically is impossible in principle. However, the concepts on which these theories rest are too general and vague on the whole and the role of experiment is to differentiate and specify them.

Concepts such as those of the ego, the id and the superego which form the principal pillars of the structure of personality, however alluring they may appear in their simplicity, obviously cannot be submitted to experiment. They correspond to very complex realities which cannot be handled as independent variables. Partial aspects, such as the self-image, self-esteem and the disagreement between them, taken to be expressions of the ego's structure, which have been chosen as experimental variables, are not satisfactory. Perhaps factors would provide a better point of departure for this work.

With very few exceptions, experimental research in the field of personality began about thirty years ago, and, though compared with its admirable theories, results have not been brilliant, it would be false to under-estimate its merit. We now understand more precisely the significance of types and traits whose complexity we can measure more accurately. The nature-nurture controversy is fading as the origin of traits begins to be perceived more clearly. From all this emerge a few of the most important outlines of personality structure which by way of conclusion we will try to retrace.

The most general conclusion resulting from a comparison of the different results is that the structure of personality must be regarded as a construct, an organization resulting from the interaction of innate tendencies and external conditions. Factor analyses provide some tentative information on innate tendencies, and one is forced to conclude that though these are rarely directly evident in measurable behaviour, they determine the structure. For this reason, it is probable that developmental and pharmacopsychological studies whose results have not been integrated into the psychology of personality, will contribute more in the future to clarify this subject. Organic drives must naturally be included among the basic tendencies—that is, among factors which are not themselves the results of experiments. However, here we enter the field of motivation and it is certain that to clarify the structure of personality we must have profound and exact knowledge of motivation. The contrary is also true, since non-organic motivation originates in the structure of the personality, and progress in this field therefore greatly depends on the reciprocity between these two currents of research.

Research on the structure of mental organization underlying what we call personality leads to at least two conclusions. The first is that interaction between the organism and the environment, particularly the social environment, produces a general organization with fairly pronounced centring. Factorial results clearly suggest, in fact, that this learning does not only lead to the creation of types of more or less independent specific responses. Secondly, if this centring corresponds to the subjective feeling of ego, as is probable, research data show quite clearly that the psychoanalytic model of three instances cannot be considered as more than a very rudimentary approximation to the real structure, as this needs more detailed differentiation.

Allport (1958), who uses a new term, the *proprium*, to designate this structure, gave what is probably the most wise and consistent description in the light of present knowledge, but the variables which enable its precise description have not yet been operationally defined.

The thirty years of research surveyed in this chapter have thus led science to a point where the essential problems and methods for solving them seem to be more clear.

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